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THE UNIVERSITY OF ALBERTA

NEUROPSYCHOLOGICAL EVALUATION OF POST-TRAUMATIC STRESS DISORDER AMONG VIETNAM VETERANS

BY

© UWE ARTHUR NEUMANN

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY
IN COUNSELLING PSYCHOLOGY

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA

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in partial fulfilment of the requirements for the degree

of... Doctor of Philosophy...............................

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ABSTRACT

Non-hospitalized Vietnam veterans (N=30) with symptoms of combat-related post-traumatic stress disorder (PTSD positive, N=7) and without symptoms (PTSD negative, N=23), as determined by the Mississippi Scale for Combat-related Stress, were examined with the Halstead-Reitan Neuropsychological Test Battery and the Wechsler Adult Intelligence Scale - Revised. Comparisons were made with age-matched civilian controls. The neuropsychological measures did not distinguish PTSD positive from PTSD negative subjects. Of note, however, was a negative correlation between some WAIS-R verbal subtests and a combat-related stress inventory. Moreover, the combined veteran group had clinically elevated scores (>95th percentile) on 47 of the 93 scores on scales measuring distractibility (Tactual Performance Test, both hands; Tactual Performance Test, memory, and Speech Sounds Perception Test). The results are explained in part by way of symptom generalization from the veterans' war time stress of combat.

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CHAPTER I

GENERAL INTRODUCTION TO COMBAT-RELATED POST-TRAUMATIC STRESS DISORDER (PTSD)

1.1 Introduction

In this chapter, civilian manifestations of post-traumatic stress disorder are presented along with the introduction to combat-related stress disorder. A brief historical outline is followed by the more specific terms of the Vietnam war experience. Finally, a rationale for a neuropsychological assessment of the disorder is given, in terms of the purpose, scope and plan of the present study.

1.2 Statement of the Problem

Human beings, thrown violently into catastrophe, are suddenly deprived of their ability to control events. Natural disasters, industrial and vehicular accidents, violent criminal acts and warfare present circumstances of surprise and destruction, often with an unavoidable threat to life, leaving the victims sharply reduced in their ability to respond competently to the events. Studies have shown that even single incidents of such trauma can leave participants emotionally scarred in the aftermath (Hoiberg and McCaughey, 1984; Newman, 1977).

Among the most consistently stressful environments is that of warfare, specifically combat. The Centers for Disease Control Vietnam Experience Study (1988), for instance, found that readjustment efforts from such trauma was difficult for even the most competent person, being never fully complete and leaving psychic residual scars amongst almost all participants, but having notably resulted in "poor psychological status", particularly for the young, the non-white and those from lower socio-economic levels of society. Egendorf, Kadushin, Laufer, Rothbart, and Sloan (1981) found high rates of maladjustment among combatants of the Vietnam war. The Vietnam war provides one of the most exhaustively documented conflicts of recent times, and given that the recognition of combat-related post-traumatic stress disorder did not occur until the aftereffects of the Vietnam war began to emerge (Goodwin, 1987), that conflict will serve as the historical background against which to conduct the present investigation.

1.2.1 Non-combat Manifestations of PTSD

Despite its close links to the history of warfare, post-traumatic stress disorder is also manifested in non-combat experiences, as a sequela to an unusual and distressing event, outside the range of normal human experiences, with increasing evidence for a similar symptomatology. Differences between civilian and military forms of PTSD exist, however, and clinical observations by Burstein, Ciccone, Greenstein, Daniels, Olsen, Mazarek, Decatur, and Johnson (1988), comparing civilian PTSD victims of motor vehicle accidents (MVA) with PTSD veterans, suggest that major differences between these two groups exist in terms of source of referral (physician referral was more typical among civilians), age (veterans tended to be younger), sex (veterans were exclusively male), socioeconomic level (veterans tended to come from lower socioeconomic levels), nature of stressor (symptom severity tended to be directly related to severity of trauma among veterans), timing of the stressor (MVA patients tended to present sooner), character of the intrusive and avoidance symptoms and treatment noncompliance behavior (according to Burstein, 1986a, there exists an inverse relationship between treatment compliance and delay of treatment onset).

Several recent studies have investigated the symptomatological similarities between war-related trauma and that experienced by concentration camp victims (Askevold, 1976; Shatan, 1985). Solomon, Kotler, and Mikulincer (1988), as well as Sigal, DiNocola, and Buonvino (1988), purportedly found post-traumatic stress disorder symptoms even among second-generation Holocaust survivors. In his seminal work on war trauma, Kardiner (1947) outlined many of the features later to be incorporated as clinical diagnostic criteria in DSM-III-R. The features of typical traumata that can lead to PTSD are outlined as follows:

> The most common traumata involve either a serious threat to one's life or physical integrity; a serious threat or harm to one's children, spouse, or other close relatives and friends; sudden destruction of one's home or community; or seeing another person who has recently been or is being, seriously injured or killed as the result of an accident or physical violence. In some cases the trauma may be learning about a serious threat or harm to a close friend or relative, e.g., that one's child has been kidnapped, tortured, or killed.

> The trauma may be experienced alone (e.g., rape or assault) or in the company of groups of people (e.g., military combat). Stressors producing this disorder include natural disasters (e.g., floods, earthquakes), accidental disasters (e.g., car accidents with serious physical injury, airplane crashes, large fires, collapse of physical structures), or deliberately caused disasters (e.g., bombing, torture, death camps). Some stressors frequently produce the disorder (e.g., torture), and others produce it only occasionally (e.g., natural disasters or car accidents). Sometimes there is a concomitant physical component of the trauma, which may even involve direct damage to the central nervous system (e.g., malnutrition, head injury). The disorder is apparently more severe and longer lasting when the stressor is of human design (American Psychiatric Association, 1987, pp. 247-248).

Typical symptoms of post-traumatic stress disorder that can flow from these traumata, as cited by DSM-III-R, are as follows:

> A. The traumatic event is persistently reexperienced in at least one of the following ways:
>
> (1) recurrent and intrusive distressing recollections of the event (in young children, repetitive play in which themes or aspects of the trauma are expressed)
>
> (2) recurrent distressing dreams of the event
>
> (3) sudden acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative (flashback) episodes, even those that occur upon awakening or when intoxicated)
>
> (4) intense psychological distress at exposure to events that symbolize or resemble an aspect of the traumatic event, including anniversaries of the trauma
>
> B. Persistent avoidance of stimuli associated with the trauma or numbing of general responsiveness (not present before the trauma), as indicated by at least three of the following:
>
> (1) efforts to avoid thoughts or feelings associated with the trauma
>
> (2) efforts to avoid activities or situations that arouse recollections of the trauma

(3) inability to recall an important aspect of the trauma (psychogenic amnesia)

(4) markedly diminished interest in significant activities (in young children, loss of recently acquired developmental skills such as toilet training or language skills)

(5) feeling of detachment or estrangement from others

(6) restricted range of affect, e.g., unable to have loving feelings

(7) sense of a foreshortened future, e.g., does not expect to have a career, marriage, or children, or a long life

C. Persistent symptoms of increased arousal (not present before the trauma), as indicated by at least two of the following:

(1) difficulty falling or staying asleep

(2) irritability or outbursts of anger

(3) difficulty concentrating

(4) hypervigilance

(5) exaggerated startle response

(6) physiologic reactivity upon exposure to events that symbolize or resemble an aspect of the traumatic event, (e.g., a woman who was raped in an elevator breaks out in a sweat when entering any elevator (American Psychiatric Association, 1987, pp. 247-248).

Although no formal epidemiologic surveys concerning post-traumatic stress disorder are available (Burstein, 1985), Helzer (1987) investigated the epidemiology of post-traumatic stress disorder in 2,493 adults examined as part of a nationwide general population survey of psychiatric disorders and found that the prevalence of a history of PTSD was 1% in the total population and about 3.5% in civilians exposed to physical attack. Even indirect victims--usually family members--have been noted. In a survey of a nationally representative sample of 12,500 adults by the Crime Victims Research and Treatment Center in Charleston, SC, it was found that more than 4 million adult Americans (about 1.8% of the population) are indirect victims of criminal or vehicular homicide, and that more than 250,000 (0.1%) of these persons experience symptoms of PTSD as a result, as long as ten years afterward (Raymond, 1988). Demographic variables play a greater role in the general population than in military-age combatants. Natural disasters, for instance, appear to afflict the aged and the very young, as well as females, more severely (Eustace, 1988). On the whole, however, civilian incidence rates are markedly lower when compared to the Vietnam veteran group (cf. Eustace, pp. 17-18). The distinction may well be the "human design" factor as generating more severe symptom levels (APA, 1987; Shatan, 1985). Among three groups of Vietnam-era veterans, Pearce (1985) found that the group who experienced a war-related traumatic event reported more symptoms than the group who experienced a non-war-related event, when both groups were compared with a non-combat veteran group.

In his survey of the literature relating to the specific effects of natural disasters on long-term personality functioning, Eustace (1988) found the evidence to be inconclusive. Among civilian victims of natural disasters, certain vulnerable personality characteristics tended to contribute to the presence of post-traumatic stress disorder, consistent with some expectations, a phenomenon quite opposite to findings among combat veterans. McFarlane (1988) found that, for instance, among a group of firefighters who had an intense exposure to a bushfire disaster, response symptoms tended to be aligned in a direction opposite to that found among combat-related PTSD, i.e., the intensity of exposure, the perceived threat, and the losses sustained in the disaster, when considered independently, were not good predictors of PTSD. Moreover, introversion, neuroticism, and a past history and family history of psychiatric disorder, were premorbid factors significantly associated with the development of chronic PTSD in this sample. By contrast, such factors were found not to contribute to combat-related PTSD (cf. Section 2.4.1).

1.2.2 History of Combat-related PTSD

Combat-related post-traumatic stress disorder has nosologically been seen as distinct from its civilian counterpart, and has been known by various terms throughout recent history, such as shell shock or combat fatigue, despite the consistency of its symptoms (Wilson, 1978). PTSD was not known as such until its entry in DSM-III, in 1980.

1.2.2.1 Pre-Vietnam Combat-related Stress Disorders

In its 19th century manifestations, combat-related stress disorder tended predominantly to be described in biological terms. For instance, during the American civil war, the phrase "irritable heart of soldiers" was used (Goldenson, 1970, p. 232). During World War I, with the widespread use of intense artillery bombardment, the term "shell shock" was first used to describe the same symptoms. The focus was again on physical symptoms: tremors, confusion, paralysis and lesser symptoms; they were held to be caused by minor brain hemorrhages from the concussion of exploding shells (Goldenson, 1970). Eventually a more psychological interpretation was given to these phenomena and by World War II (WWII), they came to be viewed in neuropsychiatric terms, such as "combat fatigue," "operational fatigue," or "combat exhaustion" (Kentsmith, 1986).

Although these new terms were broadly applied by the armed forces to describe most psychologically based stress responses, and implied a reasonable if not honorable response to combat, it was generally believed that after a short recuperation from fighting, the individual soldier could be expected to return to his duties. During World War II, for instance, treatment usually was rendered near the front lines, and took the form of supportive counselling, with the assurance to combatants that their condition was temporary and did not involve organic causes (Kentsmith, 1986). The disorder was deemed transient and reversible as it appeared in the first Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1952), published by the American Psychiatric Association, which gave a definition of Gross Stress Reaction as an overwhelming stressor invoking transient and reversible fear in normal persons. The disorder was dropped from DSM-II in 1968.

The disorder appeared as a new category, "Acute Reaction to Stress" in the 1975 (9th) edition of the International Classification of Diseases, published by the World Health Organization. There it was described as "a very transient disorder which occurs in previously normal individuals with no previous mental disorder in response to exceptional physical or mental stress, such as natural catastrophe or battle. It was held usually to subside within hours or days. Longer-term sequelae were not understood, with the result that, though only 10% of World War II fighting men were evacuated at the time of initial presentation, "well over 50% of all patients in Veterans Affairs hospitals were psychiatric cases after the war" (Goldenson, 1970, p. 233). Indeed, as consequence of the disorder's recognition by the Veterans' Administration (VA), some World War II veterans, about 30 years after trauma occurrence, are presenting with symptoms of post-traumatic stress disorder (Van Dyke, 1985).

The prevailing view of the disorder as a temporary dysfunction, and the pattern of on-site treatment, were continued during the Korean war, and even lower evacuation rates due to combat fatigue were seen, i.e., about six percent (Bourne, 1970).

1.2.2.2 The Vietnam Experience

During World War II and the Korean war, it was discovered that the average combatant could be expected to survive some 270 to 280 days of combat without a neuropsychiatric breakdown, barring other forms of injury or death (Fussell, 1989). In an effort to limit the frequency of battlefield breakdowns during the Vietnam war, the United States government instituted a limited tour of combat duty during that war--12 months for enlisted men and non-commissioned officers, 6 months for officers and 13 months for Marines. In terms of battlefield presentations, the tactic was a success, with psychological casualties reduced to 12 per 1000 (Bourne, 1970). But a delayed onset of symptoms began to appear among both those who had presented for treatment during their tour, and those who had not. What was unusual was the large number of veterans being affected after Vietnam. As the war was winding down in the 1970's, the number of neuropsychiatric disorders increased (Goodwin, 1981). This unexpected emergence of delayed onset PTSD was reflected as a conceptually broader disorder by DSM-III (American Psychiatric Association, 1980) and DSM-III-R (American Psychiatric Association, 1987) entries, and both listings recognized that (a) the disorder could be chronic, and have a delayed onset; (b) not all victims had predispositions toward the disorder; and (c) some cases of post-traumatic stress disorder may develop another mental disorder at the same time, such as an organic disorder secondary to an injury, anxiety or depression (American Psychiatric Association, 1987, p. 249).

Several features unique to the Vietnam war have been held to contribute to the exacerbation of post-traumatic stress disorder symptoms (Goodwin, 1987; Stretch, 1988). For instance, the fixed tours of duty, during which individual combatants would know their own expected return from overseas (known as DEROS), while resulting in a welcome decrease of Vietnam battle-field neuropsychiatric casualties as outlined above, nevertheless had unexpected, and paradoxical, side effects. DEROS became a very personal experience, with every individual rotated for his/her own tour. For many the war became a solitary experience, beginning "the day he arrives in the country, and ending the day he leaves" (Bourne, 1970, p. 12). Joining an active combat unit, the new man was initially shunned by serving troops. Not the least of the reasons for this alienation was emotional numbing that accompanies grief regarding combat losses the unit may have experienced. Few were prepared to make friends with an individual whose unknown combat skills might result in his quick demise (as, for example, killed in action) or departure (wounded in action). The newcomer "feels no continuity with those who precede or follow him. He even feels apart from those who are with him but rotating on a different schedule" (Bourne, p. 42). Complete strangers would be transferred into the unit whenever individual rotations were completed. The consequence of this individualization of the combat experience was that unit morale, esprit de corps, or unit identification suffered greatly (Kormos, 1978). Moreover, this decision violated the Army's own troop patterns, taken from the Prussian model (Keegan, 1976), where, for maximum small group cohesiveness, groups of recruits (often from the same geographic region) train together, and are typically deployed together in the field of combat (Keegan, pp. 47-49). In Vietnam, small group bonding was for the most part disrupted by frequent rotations of individuals arriving for their tour and replacing those whose DEROS had arrived.

Notwithstanding, some individuals formed friendships under fire, often coalescing into small, seasoned combat groups such as those noted in previous wars (Grinker & Spiegel, 1945). For these people, separated on their DEROS, the journey home would have been a poignant experience, riding in an aircraft full of strangers, with whom little could be shared. Feelings of excitement and anticipation of returning to "the world" would likely have been undermined by unanswered questions about the welfare of their former comrades, whose ongoing field experiences might well have continued to benefit from the returnee's skills and experience. This ambivalence for some will likely have contributed to the development of the recognized survivor guilt of post-traumatic stress disorder (Glover, 1985; Yager, Laufer & Gallops, 1984.

In Vietnam, guerilla warfare became a combat experience for which United States forces were ill equipped. The corruptness of the South Vietnamese regime, the untrustworthiness of its high command, the reluctance and frequent cowardice of their allies in the Army of the Republic of Vietnam (ARVN), and widespread hostility to the American presence among the population served to alienate the Americans while "in-country". Moreover, unlike earlier wars, there were no psychological benefits from winning embattled ground: strategic and tactical aims were simply to kill the enemy in "search and destroy" missions that were often repeated over the same area week after week. Despite previous "jungle warfare" training exercises in settings like Panama, nothing prepared young troops for the debilitating encounters with the heat and humidity of Vietnam, with months-long isolation on remote fire bases, stealth patrols shattered by ambushes and booby traps from an enemy that rarely fought in the open, an enemy that blended with the local populace by day, and rained shells on American positions by night, an enemy whose fighting zeal was often suicidal, and whose individual commitment to reunite their homeland and oust an unpopular southern regime far exceeded the political will of the U.S. military to prevent those goals. In an interesting comparison between the much lighter psychiatric casualty rate of the British army in the Falklands campaign and the American rates of WWII and Vietnam, Price (1984) makes the observation that

British forces used hospital ships in close proximity to their operations zone, psychiatrically screened their combatants, deployed only professional, elite units, experienced lower combat intensity and provided psychiatric personnel in line units. Because of these rather "optimal conditions," Price issues the caveat that the results of this war should not be used to predict a similar outcome in future combat. The basic incomparability of the Falklands campaign with that of Vietnam--politically, environmentally, strategically and tactically--is not addressed.

The typical combatant in Vietnam was 19.2 years of age (Wilson, 1978). These adolescents tended to need intense attachments to other men in their unit, and to the degree that they could be formed, they became peer groups, functioning like any peace-time peer group might, i.e., as an intermediary stage between dependency on their family and emotional maturity. Combat conditions particularly maximized the impact of such peer group cohesion. For these young men, the death of a friend was frequently experienced as the dissolution of their support group (Van der Kolk, 1985). True, Goldberg, and Eisen (1988) identified increased psychological vulnerability of younger veterans to the development of post-traumatic stress disorder. Wilson and Krauss (1985, pp. 102-147) also found that the occurrence of traumatic events during the formative late adolescent years was especially predictive of higher stress symptom outcome.

Finally, the American social and political backdrop for this most unpopular war was steadily undermined by years of graphic media portrayals of American combat casualties, and civil unrest in the streets of Vietnamese and American cities protesting the policies of Washington and Saigon. In a schism that, despite the intervening years, is still alive for many, fighting men perceived themselves to be betrayed by American anti-war activists and congressional "doves" who sought to prevent more effective military responses to the enemy. America's waning enthusiasm for the war was said by many to have become irrevocable after the February 1968 Tet offensive, during which media reports of a North Vietnam orchestrated nation-wide series of assaults against ARVN and United States installations was widely, but erroneously, perceived as successful, and served to distort events untenably. (Indeed, the offensive, and the political reaction at home contributed to President Johnson's decision not to seek re-election that year.) Television viewers, for instance, were presented with the now infamous execution of a Viet Cong operative on the streets of Saigon by a police official in what appeared to be an impulsive response. They were not shown, (as the Marines discovered) the estimated 8,000 civilians executed by the Viet Cong during their occupation of Hue. Despite such symbolic losses as Vietcong incursions into the American embassy compound in Saigon, and the short-term loss of the ancient capital city of Hue, the success of American strategic and tactical responses resulted in a virtual destruction of Vietcong effectiveness, and the conduct of the war from that time to the end, was almost totally managed by the North Vietnamese Army (NVA), abetted by about 200,000 Chinese troops. In sum, media coverage, perhaps without intent, but by its immediate, emotive power (as via electronic media reports) and its logistical limitations (deployed typically among allied held territory), served to present a one-sided focus throughout this politically sensitive commitment.

The results of slanted media coverage on American popular opinion, however, had a devastating effect on the returnee (cf. Emerson, 1976; Goldman and Fuller, 1983; Isaacs, 1983; Mason, 1983). Opposition to the war had long focussed on the remote and--in American public opinion--non-vital issues concerning Vietnam. The contemporary popular perception was shifting ever more in the direction that, while no clear threat to the nation was evident in this remote civil war, young Americans were nevertheless engaged in propping up a puppet regime, laying waste to huge tracts of countryside, and killing multitudes of innocent civilians. While some lamented the needless loss of American lives, others criticized the military's battlefield conduct, generalizing perhaps from highly publicized incidents such as occurred at My Lai. Returnees were frequently, often to their deep shock, vilified as "baby killers" by the political left and their naive, often youthful sympathizers, denounced as losing the war by their

Korean war and World War II veteran forbears, and--most frequently--treated by many with mixtures of fear, loathing, mystery or indifference. No preparation of the civilian population had preceded their return, as returnees after WWII; no films depicting their readjustment struggles were made; no victory parades were held, except in isolated instances. They were treated, instead, to demonstrations denouncing them, and to some public figures and much of the intelligentsia deriding their commitment and performance of their duty. Most often, in private and public domains, they were given little faith, opportunity or courtesy to express themselves and their personal anguish.

In testimony before the U.S. Senate Committee on Veteran Affairs, John P. Wilson (1978) tried to further the understanding of post-traumatic stress disorder (emphasis in the original):

> If you were demonic and powerful enough to want to make someone "crazy" following a war like Vietnam, what would be the worst set of social, economic, political, and psychological conditions you could create for the returnee?
>
> First, you would send a young man fresh out of high school to an unpopular, controversial guerrilla war far away from home. Expose him to intensely stressful events, some so horrible that it would be impossible to really talk about them later to anyone else except fellow "survivors". To ensure maximal stress, you would create a one-year tour of duty during which the combatant flies to and from the war zone singly, **without** a cohesive, intact, and emotionally supportive unit with high morale. You would also create the one-year rotation to instill a "survivor mentality" which would undercut the process of ideological commitment to winning the war and seeing it as a noble cause. Then at DEROS you would rapidly remove the combatant and **singly** return him to his front

> porch **without** an opportunity to sort out the meaning of the experiences with the men of his unit. No homecoming welcome or victory parades. Ah, but yet, since you are demonic enough, you make sure that the veteran is stigmatized and portrayed to the public as a "drug-crazed psychopathic killer." By virtue of clever selection by the Selective Service system, the veteran would be unable to easily reenter the mainstream of society because he is undereducated and lacks marketable job skills.
>
> Further, since the war itself was so difficult, you would want to make sure that there were not supportive systems in society for him, especially among health professionals at VA hospitals who would find his nightmares and residual war-related anxieties unintelligible. Finally you would want to establish a GI Bill with inadequate benefits to pay for education and job training, coupled with an economy of high inflation and unemployment.
>
> Last, but not least, you would want him to **feel** isolated, stigmatized, unappreciated, and exploited for volunteering to serve his country (pp. 221-222).

1.2.3 Incidence of Vietnam War-related PTSD

The Vietnam era is officially defined as the period from August 5, 1964 to May 7, 1975. The total number of Americans involved in the U.S. military during this time included 8,911,000; of these, 187,000 were female. About two-thirds of all combatants volunteered for service. Canadian contribution to the Vietnam war has been estimated at between 40,000 and 60,000, or about 0.9% of United States forces (MacDonald, 1989; McAndrew, 1986; Stretch, 1988), although the Canadian Department of National Defense admits to only about 2,000 volunteers. The average age of the Vietnam combat soldier was 19.2 years (Wilson, 1978). (By contrast, the average age of a WWII combatant was 26 years; and that of a Korean war soldier was 29.) The total number of participants in the south-east Asia theater of combat operations was 2,771,520. Of that number, 33,000 were female.

About 57,500 combatants died in Southeast Asia--46,616 from hostile action. There were about 330,000 wounded, 150,000 serious enough to be hospitalized. There are now about 75,000 seriously handicapped individuals and 25,000 totally disabled persons from the war (Wilson, 1978).

Vietnam veterans have experienced symptoms of post-traumatic stress disorder, including persistent problems with health, emotional well-being and social adjustment. Black veterans are reported to be suffering at even greater rates, given racism in the military, racial and social upheaval during the war years, and limited social and economic opportunities on their return (Allen, 1986).

In his survey of incidence and etiology of post-traumatic stress disorder among Vietnam veterans, Stretch (1986) quotes the Center for Policy Research study of 1,400 veterans from various parts of the United States to yield the following observations: (a) combat operations had a significant, positive relationship to alcohol and drug use, arrests, medical problems, and stress-related symptoms; (b) stress-related symptoms are concentrated among combat veterans who served during the late years of the war; (c) the incidence of stress-related symptoms can be reduced substantially by supportive relationships with others and (d) the incidence of stress symptoms during and immediately after military service diminishes among heavy combat veterans who live in smaller cities. However, contrary to unsavory entertainment depictions of the veteran as sociopathic or criminally motivated as a result of combat duty, Shaw, Churchill, Noyes and Loeffelholz (1987) found, in an investigation of incarcerated Vietnam veterans, that while the incidence of PTSD was about equal between incarcerated veterans and their non-incarcerated peers, no direct relationship between PTSD and crimes leading to imprisonment emerged.

In a random sample of 2,858 American Legion members (i.e., a non-clinical sample), Snow, Stellman, Stellman, and Sommer (1988) found that the post-traumatic stress disorder rate ranged from 1.8% to 15% of the total sample, depending on whether "exposure" to combat in Vietnam was defined relatively narrowly or broadly. In an investigation of psychosocial characteristics of Vietnam-era veterans, the Centers for Disease Control (1988) found, in their random sample of 2,490 Vietnam and 1,972 non-Vietnam veterans, who were similar in terms of levels of education, employment income, marital status, and satisfaction with personal relationships, and who entered the United States Army from 1965 to 1971, a 4.5% incidence of depression among Vietnam veterans, compared to 2.3% of non-Vietnam veterans. The incidence of anxiety in this study was found to be 4.9% and 3.2%, respectively; and alcohol abuse or dependence was found to be 13.7% and 9.2% respectively. About 15% of Vietnam veterans experienced combat-related PTSD at some time during or after military service. However, Laufer, Brett, and Gallops (1985) question the symptomatology of PTSD as it appears in DSM-III, specifically the process of aggregating symptoms, which may lead to underestimating of its prevalence. They propose distinguishing between the responses of denial, and reexperiencing, of the traumatic event(s), as an alternative and potentially more useful approach for understanding the disorder. Roberts (1988) also argues that an overall underestimation has occurred in the published rates of incidence. An overall higher estimate has been made, that from about 500,000 to 700,000 veterans (about 20% of all combatants) are likely still suffering from PTSD (Egendorf, Kaduschin, Laufer, Rothbart, & Sloan, 1981; Fleming, 1985; Helzer, Robins, & McEvoy, 1987).

In a mailed questionnaire survey of Canadian Vietnam veterans, Stretch (1988), found that of the 123 subjects who responded, just under 15% were unemployed, with an additional 10.7% employed part-time who would prefer to work full-time. Of those who were working, annual gross income was $10,000 or less for 13.4%, and 50.4% reported earning over $30,000. Of note was a PTSD prevalence rate, currently being experienced, of about 56% of respondents. Results indicated that those veterans who were Canadian citizens at the time of their service in Vietnam have significantly higher levels of current PTSD symptomatology than do those veterans who were U.S. citizens at the time of their service. Moreover, the problems with PTSD have not diminished over time, they have only gotten worse. Stretch reports that a likely cause to this significant development is the lack of social support from Canadian society as well as the lack of any medical or psychological readjustment counselling benefits from either the government of Canada, or, until recently, the United States.

Vietnam veterans have a suicide rate about 33% higher than their non-combatant age mates, and upward of 200,000 are estimated to have killed themselves since their return (Laufer, Brett, & Gallops, 1985). Laufer et al. also reported that Vietnam veterans, particularly combat veterans, show an increased number of medical problems when compared to Vietnam-era veterans.

Moreover, the level of combat stress experienced by individual veterans has been linked to the severity of the stress response. Commenting on previous research among Israeli veterans, Weisenberg, Solomon, Schwarzward, and Mikulincer (1987) indicate that war-related post-traumatic stress disorder in soldiers treated for psychiatric problems during combat and in a control group of combatants differed qualitatively for type and scope of syndrome. The Impact of Event Scale (IES: Horowitz, Wilner, & Alvarez, 1979) is a measure, complementary to the DSM-III, that summarizes the impact of trauma on two major dimensions, intrusion and avoidance. Intrusion is characterized by distressing thoughts, images, feelings, nightmares, and repetitive behavior, whereas avoidance is characterized by psychic numbing, conscious denial of the trauma, and blunted sensation. Prior research (Schwarzwald, Solomon, Weisenberg, & Mikulincer, 1987) supported the efficacy of the IES for assessment of the effects of battle trauma.

1.3 Neuropsychological Assessment of Cerebral Functioning

The focus of this investigation is the measured state of neuropsychological function among veterans. Implied therein is a brain-behavior correlation, and what follows is a brief history of this concept, a rationale for its inclusion in the present study, and a description of a contemporary battery of neuropsychological tests which were used, the HRNTB.

1.3.1 The Rationale for a Neuropsychological Investigation

Brain-behavior relationships have been a topic of scholarly enquiry since the early Greeks (Kolb & Whishaw, 1985, p. 304). The rational part of Plato's (420-347 B.C.) tripartite soul was placed in the brain, because of its proximity to the heavens. Aristotle (384-322 B.C.) anomalously believed the heart to be empowered with reason, and argued that the brain's coolness relative to the warmth of the heart, and its large size, relative to that of other animals, indicated a function of blood temperature regulation. Galen's (A.D. 129-199) dissections of felled gladiators convinced him of the brain's supremacy in thinking. The unitary mind--the rational soul--was devised by Descartes (1596-1650), who separated its non-material quality from the machinery of the body. He located the soul within the pineal gland. Descartes was also the first to identify mental processes as occurring within brain tissue.

The problem as to the ultimate relationship between mind and body profoundly divided brain researchers during the 19th century. On one side of the argument were localizationists, such as the anatomists Gall (1758-1828, the developer of phrenology) and Spurzheim (1776-1832, Gall's student), and physicians Wernicke (1948-1905) and Broca (1824-1880), who identified speech and language disorders as sequelae of left hemispheric lesions. On the other side of the argument were the equipotentialists, or "aggregate field" theorists, as they were also known (Kandel, 1981), such as Flourens (1794-1867) and Lashley (1890-1958), who argued that each part of brain tissue is able to encode or produce the behavior normally (or previously, such as after a cerebral impairment) controlled by another area (Goldenson, 1984). The neurological investigations of Hughlings-Jackson (1835-1911), particularly his concept of the hierarchical organization of the nervous system in terms of function, the concept of the special nature of the cerebral cortex (especially its subdivisions and interconnections), and the development of the neuron hypothesis, i.e., that the central nervous system is composed of discrete, autonomous units, that can interact but are not physically connected, have largely provided the foundations of modern neuropsychology.

To be sure, the earlier attempts at correlating behavior with brain site met with some initial resistance among 20th century neurologists, but discoveries in neurosurgery--for example, the microstimulation and single unit recordings of Penfield and Jasper (Kandel, 1981)--and developments in psychometrics--as for example, the attempts at standardized measurements of children's intelligence by Binet and Simon (Gardner, 1983, p. 15)--have helped to fuse the argument that mind and body are interconnected. Today, the word mind is used primarily to refer to those functions of the body that reside within the brain. For instance, talking, thinking, feeling, and dreaming are mental functions due to electrical impulses passing through the complicated and highly specialized electrical circuits that make up the human brain (Andreason, 1984). Among the neurosciences that evolved to address the relationship of brain and behavior was what came to be called, by 1949, the discipline of neuropsychology. Kolb and Wishaw (1985) define the term as the "study of the relation between brain function and behavior. Although the study draws information from many disciplines--e.g., anatomy, biology, biophysics, ethology, pharmacology, physiology, physiological psychology, and philosophy--its central focus is the development of a science of human behavior based on the function of the human brain" (p. 303).

A particular focus of this investigation is the relative functioning, in terms of deficits or impairments, of the two cerebral cortices, dominant and non-dominant. Evidence for lateralization occurs in the early developing brain, where territories of the left temporal and parietal lobes, which are essential for language understanding in the great majority of adults, are already asymmetric in a human fetus of twenty-four weeks gestational age (Trevarthen, 1987).

In the adult brain, "functional lateralization" has come to connote stability of arrangement, and usually implies asymmetry of the brain (Berent, 1981; Luria, 1966). Although controversial, and under widespread review, the prevailing tendency is to ascribe specific functions to the dominant and non-dominant hemispheres. The dominant (in right-handed persons, the left) hemisphere, is typically seen [illegible] the site for mediation of verbal and analytical processes, including speech and language, complex motor functions, verbal conceptualizing, mathematical thinking, left-right discrimination, time concepts and vigilance (Berent, 1981). Agreement about the non-dominant hemisphere's functions is not as readily found among investigators. Typically, however, it is viewed as the site of mediation for non-verbal functions, including spatial orientation, integration or abstract concept formation, tactile perception, picture identification, facial recognition and creative (associative,non-lineal) thinking (Berent, 1981).

And in terms of stress dysfunctions, Tucker, Roth, Arneson, and Buckingham (1977) cites numerous studies consistent with their finding of greater right hemisphere activation under conditions of emotional arousal.

Tyler and Tyler (1982) studied the cognitive performance of 24 high and 36 low trait anxious undergraduates under conditions of high and low situational stress, using tasks requiring greater contribution of the right or left hemisphere. In addition, a perceptual task was adapted from visual information processing research to assess the subjects' global or analytic approaches to perception; if anxiety increased the left hemisphere's contribution to perception, anxious subjects might be expected to be more analytic and detail oriented. Results showed no significant differences on left hemisphere tasks but a significant interaction of trait by state anxiety for right hemisphere tasks: Low trait subjects performed better and high trait subjects performed more poorly under situational stress. Trait anxiety showed a significant main effect on visual information processing strategy, low subjects tending to be more global and high subjects tending to process the stimulus analytically. The authors argue that their results would support the utility of a neuropsychological model in describing the effect of emotion on perception.

1.3.2 The Halstead-Reitan Neuropsychological Test Battery (HRNTB)

The first systematic investigation of brain-behavior relationships that was transposed into a series of reproducible and standardized clinical procedures was undertaken by Halstead (1947). The development of these tests arose from the identification of patterns of cognitive skills and weaknesses, as revealed by brain-damaged persons, and the comparison of the findings with those of persons with no known cerebral damage. The correlation of the test patterns of cognitive functions, compared with increasingly sophisticated neurological assays of cortical injury, has formed the basis of clinical neuropsychology's domain. Expanding from single "screen" tests, such as Bender-Gestalt drawings (Anastasi, 1968), criticized by some to be "egregious underestimations of the complexity of brain structures, functions, pathology and behavioral correlates" (Boll, 1981, p. 577), Halstead's major contribution to the field of neuropsychological assessment was the use of a "battery" of objective tests in standardized administrations, scored quantitatively, and with a calculable global impairment rating, the Halstead Impairment Index (Reitan & Wolfson, 1985). Halstead's student, Reitan, supplemented and modified Halstead's tests to form the Halstead-Reitan Neuropsychological Test Battery (HRNTB), whose individual test functions are outlined below. By use of statistically identified relationships between test scores (Swiercinsky, 1978), the HRNTB permits predictions about presence, nature (diffuse or focal, static or changing), and site of possible lesions in the brain (Wheeler & Reitan, 1963).

Despite some short-comings of the HRNTB, such as "inadequate norms" (Lezak, 1983, p. 564), bulkiness and relatively lengthy administration (from six to eight hours), the reliability and validity of the battery to assess the integrity of cerebral functioning has been extensively investigated and corroborated. In addition to concurrent validation work (comparing HRNTB test scores and patterns against known neurological diagnoses) by the original authors (Halstead, 1947; Reitan, 1959, 1966; Reitan & Davison, 1974), the first validation of the HRNTB by investigators independent of the author and his co-workers was that of Vega and Parsons (1967), who found that the HRNTB correctly classified brain-damaged populations from controls with 73% accuracy. Reitan (1966) had correctly identified 89% of patients with a focal lesions and 96% of patients with diffuse brain damage in his study. The hit rate for right hemisphere lesions was 69%, and for left hemisphere lesions, 62.5%. The findings of Filskov and Goldstein (1974) corroborated these rates, with their study of the HRNTB correctly identifying cerebral dysfunction 100% of the time. Schreiber, Goldman, Kleinman, Goldfader, and Snow, (1976) received similar impressive results in their work with 78 neurological patients. Of the 62 patients who proved to have neurological disease, together with the 16 subjects who turned out to be neurologically normal, the

HRNTB was 97% accurate in predicting no brain damage.

Matarazzo, Matarazzo, Wiens, Gallo, and Klonoff (1976) demonstrated that the test-retest reliability of the HRNTB over a 20 week period is very high in normal subjects, brain-damaged populations and chronic schizophrenics. Boll (1981), Lezak (1983), and Swiercinsky (1978) give more detailed accounts of the battery's validity and reliability measures.

Moreover, several investigators have examined the battery's ability to delineate brain function as part of psychiatric disorders (e.g. Golden, Osmon, Moses, & Berg, 1981; Goldstein & Shelley, 1972). Chelune (1979) found that, though Wechsler's scales alone should not be used as a test for brain damage with schizophrenics, use of the HRNTB may add significant discriminatory power. Heaton, Baade, and Johnson (1978) have reviewed 94 studies published between 1960 and 1975 comparing the test scores of adult psychiatric patients with brain-damaged groups or against established norms, and found that the tests discriminated with a median hit rate of 75% between all psychiatric categories (except chronic schizophrenia) and brain-damaged groups. De Wolfe, Barrell, Becker, and Spaner (1971), as well as Klonoff, Fibiger, and Hutton (1970) found evidence for left hemisphere implication of functions among schizophrenics. Louks, Calsyn, and Lindsay (1976) selected 20 patients with deficits lateralized to the left hemisphere and 34 with deficits lateralized to the right hemisphere from a pool of 94 veterans who had been referred for psychological examination from both medical and psychiatric sources and who had been given a slightly abbreviated HRNTB. Fifteen patients with lateralized left and 15 with lateralized right cerebral dysfunction were then matched for overall severity of dysfunction, age, and education (all were males). The "Neurotic-Psychotic Index" (L+Pa+Sc-Hy-Pt) as presented by Meehl and Rosen (1955) was calculated from the Minnesota Multiphasic Personality Inventory of these 30 subjects with a cutoff of 45 for the dichotomization into neurotic and psychotic categories. There was a significant association between right-hemisphere deficits and "neurotic" and left-hemisphere deficits and "psychotic" distributions. In a major series of neuropsychological investigations by Flor-Henry (1976), Flor-Henry and Yeudall (1979), and Flor-Henry, Fromm-Auch, Schopflocher (1982), modified HRNTBs were used to determine that (a) mean performance (i.e., non-verbal) IQ was similar in schizophrenia and the affective psychoses (mania and depression combined); (b) there was a mainly dominant hemisphere dysfunction in schizophrenia and a non-dominant hemisphere dysfunction in the manic-depressive syndrome; (c) a continuum of increasing neuropsychological disorganization in the psychoses was also found: least in depression, intermediate in mania and maximal in schizophrenia. Similar findings were reported by Taylor and Abrams (1978).

Klonoff, Clark, Horgan, Kramer and McDougall (1976) contrasted neuropsychological results (using the HRNTB) of two groups of Canadian WWII prisoners, a high stress group and a low stress group. The high-stress group's performance was significantly worse on two variables, the Category and Seashore Rhythm tests, with the Speech Sounds Perception test approaching significance (Klonoff, et al., p. 248). No scientific papers dealing with Vietnam war-related post-traumatic stress disorder published by the American Psychological Association appeared before 1981. No published HRNTB investigations of Vietnam-related PTSD were found in the computerized literature search conducted by the writer.

1.4 Assessment Procedures of PTSD

No quantitative measure of post-traumatic stress disorder symptomatology appears now to be in general use (Friedman, Schneiderman, West, & Corson, 1986; Keane, Malloy, and Fairbank, 1984). Two instruments frequently in use to assess combat stress are the Combat Scale Revised (Laufer, Yager, & Frey-Wouters, 1981) and the Vietnam Experience Scale (Lund, Foy, Sipprelle, & Strachan, 1984). The Subscales from the Minnesota Multiphasic Personality Inventory and Millon Clinical Multiaxial Inventory subscales, particularly those scales dealing with the neurotic involvement of tension, anxiety and depression as well as problem checklist measures of psychosocial dysfunction and post-combat adjustment to aid in discriminating PTSD from non-PTSD veterans have been developed and used by several investigators (Burke, & Mayer, 1985; Cannon, Bell, Andrews, & Finkelstein, 1987; Centers for Disease Control, 1988; Fairbank, Keane, & Malloy, 1983; Foy, Carroll, & Donahoe, 1987; Foy, Sipprelle, Ruger, & Carrol, 1984; Golstein, van Kammen, Shelly, Miller, and van Kammen, 1987; Hyer, Woods, Boudewyns, Bruno, & O'Leary (1988); Klonoff, Clark, Horgan, Kramer, & McDougall, 1976; Sutker, Allain, & Motsinger, 1988; Sutker, Winstead, Goist, Malow, & Allain, 1986). (See also Section 2.2.1).

Keane, Malloy, & Fairbank, (1984) have developed a Minnesota Multiphasic Personality Inventory - post-traumatic stress disorder (MMPI-PTSD) scale that shows some promise in the diagnosis of PTSD among Vietnam veterans. In the original study, Keane et al. (1984) showed an 82% correct classification of 200 patients, of which 100 had PTSD. A cross-validation of the Keane scale by Watson, Kucala, and Manifold (1986) showed that the Keane scale discriminated PTSD-positive subjects from normals at a substantial level of accuracy and PTSD-positive from PTSD-negative subjects at a more modest level. Given considerably lower scores of their subjects, when compared to those of Keane et al., the authors recommend that local norms be developed and used for this scale. In the second validation study, however, (Hyer, Boudewyns, O'Leary, & Harrison, 1987) found only a moderate correct classification rate of 69%. The MMPI-PTSD scale consists of 49 MMPI items, has an established cut-off point of 30, and has other decision criteria to reduce false positives (Fairbank, McCaffrey, & Keane, 1985). (The scale was used among the Canadian subjects in the present study, but not among the Americans; the item list is given in Appendix III).

In an attempt to address the "major concern of this or any scale [that is, of] symptom exaggeration or faking bad" Hyer, Fallon, Harrison, and Boudewyns, (1987) sought to clarify the subtle-obvious nature of the items that comprise the MMPI-PTSD scale. The authors defined three groups of Vietnam inpatients (n=75) by both clinical and actuarial methods into post-traumatic stress disorder combat, non-post-traumatic stress disorder combat, and non-combat. Applying obvious/subtle items from the F scale (a scale tapping the "frequency" of globally perceived pathology) of the Minnesota Multiphasic Personality Inventory to these groups, the investigators found that the PTSD group tended to exaggerate the F scale items, and generally tended to respond to obvious items, relative to the other groups.

1.4.1 The Mississippi Scale for Combat-Related PTSD

The Mississippi Scale for Combat-Related PTSD was developed by Keane, Caddell, and Taylor (1987), and is in widespread use by VA hospitals and Vet Centers (see Appendix II). The scale contains 35 items that sample the domain of PTSD symptoms. In the first of three validation studies of the Scale, 362 Vietnam veterans seeking help at Vet Centers were used to confirm the internal consistency of the instrument and to provide an assessment of its factor structure. Factor 1 (nine items) reflected intrusive memory and depressive symptomatology. Factor 2 (five items) focused on interpersonal adjustment problems, and Factor 3 (three items) represent lability of affect and memory. Factors 4 and 5 (three items each) measure ruminative features of PTSD and other interpersonal difficulties. Sleep problems comprise the two items that load on Factor 6.

1.4.2 Psychophysiological Assessment of PTSD

Consistent with a hypothesized organic etiology for post-traumatic stress disorder, as examined in Section 2.5 in Chapter II, the most noteworthy and promising of the number of approaches for the diagnosis of PTSD has been the measurement of psychophysiological reactivity to mild auditory and visual stimuli from combat. In an early investigation of this kind, Dobbs and Wilson (1961) compared electroencephalographic (EEG) alpha waves, heart rates, and respiration rates of three groups to recorded combat sounds and light stimulation. The groups were (a) eight "decompensated" combat veterans who were described as suffering from "combat neurosis"; (b) 13 veterans of approximately the same age who had combat experience but who were seen as "compensated"; and (c) 10 university students who had never been in combat and who were all younger than any member of groups (a) or (b). Although several groups showed significant within group changes in all three responses from baseline to the presentation of the combat sounds no specific data on the "decompensated combat veterans" were presented and no comparisons between this patient group and the other two groups were made. Notwithstanding, Dobbs and Wilson (1961) concluded that there existed a "remarkable similarity of the behavioral and physiological responses of the war neurosis to those produced experimentally in animals through conditioning" (p. 43).

Blanchard, Kolb, Pallmeyer, and Gerardi (1982) found that heart rate, skin resistance, electromyography, and blood pressure responses to combat stimuli delivered during a task of mental arithmetic to eleven 32 to 42 year old male Vietnam veterans with post-traumatic stress disorder correctly discriminated the patients from 11 age-matched, well-adjusted combat veteran controls at a 95% rate. In a later study (Blanchard, Kolb, Gerardi, Ryan, & Pallmeyer, 1986), the cardiac responses of 91 Vietnam combat veterans who either met (n=57) or who did not meet (n=34) the DSM-III criteria for PTSD were examined to a neutral stressor mental arithmetic or to a relevant stressor of progressively louder (40 to 80 decibels) combat sounds. The authors concluded that examination of individual subject data permitted accurate identification of 70.2% of PTSD veterans and 88.2%

of combat veterans with only 9.7% false positives, using a single cutoff score on the highest heart rate response to combat sounds. A further study by Pallmeyer, Blanchard, and Kolb, (1986) found comparable levels of psychophysiological reactivity to combat cues. Knight, Keane, Fairbank, Caddell, and Zimering (1984) found that psychophysiological responses of PTSD veterans were greater than those found in combat veterans suspected of PTSD, but who did not have PTSD.

In combination, the findings of psychophysiological reactivity suggest that there is consistent arousal to combat cues in post-traumatic stress disorder veterans and that this arousal discriminates veterans with PTSD from appropriate comparison subjects. Consistent with the multiaxial assessment approach recommended by Keane et al. (1987), the "multiply determined" stress response patterns of the individual (Green, Lindy, & Grace, 1985) and in terms of the present investigation, it is posited that neuropsychological assessments of veterans, using standardized neuropsychological instruments, coupled with an instrument in standard use for the screening of PTSD, such as the Mississippi Scale, may help to clarify the symptom picture of this disorder.

1.5 Aim of the Present Study

There exists a dearth of systematic clinical data about the largest segment of Vietnam combat veterans, those who did not present for treatment at Veterans Administration (VA) hospitals (Grady, Woolfolk, & Budney, 1989). This population, on the whole, has typically eschewed post-war involvement with government, and investigations have necessarily required active recruitment of subjects (cf. Stretch, 1988). Past studies typically have relied on veterans who have received treatment or evaluation for benefits at VA facilities, though there are some notable exceptions, such as the telephone study by the Centers for Disease Control Vietnam Experience (1988).

The aim of the present study is to use standardized cognitive, motor and sensory-perceptual tests, such as the HRNTB, to assess Vietnam veterans, both with and without the presence of post-traumatic stress disorder symptoms of psychological disruptions, to determine neuropsychological correlates of the disorder. To the degree that PTSD is a function of disordered cerebral processing, as outlined in Chapter II, neuropsychological measures have been chosen because of their documented sensitivity to identifying such disordered processing.

In terms of specific HRNTB and WAIS-R test results expectations of deficits are two-fold: (a) consistency with DSM-III-R symptomatology, in terms of Section D, i.e., "increased arousal" resulting in difficulty concentrating and hypervigilance; scores on the following tests would be implicated:

Speech Sounds Perception Test (errors)

Trail-Making Test, Parts A and B (time)
Halstead Category Test (errors)
Tactual Performance Test: Dominant, non-dominant and
both hands (time), as well as memory and
location scores
Seashore Rhythm Test
WAIS-R: Arithmetic, Digit Span and Digit Symbol;

and (b) consistency with the findings of Klonoff, et al. (1976), in terms of the Halstead Category, Seashore Rhythm and Speech Sounds Perception Tests.

Finally, Pearson Correlation Coefficients will be calculated between all neuropsychological variables (including WAIS-R) and the individual veteran's score on the Mississippi Scale for Combat-Related Stress (see p. 34), regardless of the cutoff value of 107, for purposes of examining dysfunctional trends among score data.

A group of non-hospitalized veterans is (a) interviewed for symptoms of PTSD; (b) administered a widespread measure of PTSD, i.e., the Mississippi Scale of Combat Stress; and (c) tested with the HRNTB to determine neuropsychological function patterns.

1.5.1 Purpose

The purpose of the study is to:

(1) compare PTSD positive and PTSD negative subjects neuropsychologically

(2) expand available documentation of veterans' neuropsychological performance patterns

(3) identify individual or groups of standardized neuropsychological tests which may be useful in working with veterans

(4) provide the impetus for further evaluation of both Canadian and American soldiers and combat veterans.

1.6 Plan of the Dissertation

The present investigation is divided into five chapters. The first chapter outlined a general introduction to combat-related post-traumatic stress disorder, its history as a sequela of warfare, and provided a rationale for the use of standardized neuropsychological measures to illustrate the symptoms of the disorder. In the second chapter, clinical features of the disorder are presented, along with diagnostic issues and etiological theories. Given the case for a neuropsychological investigation of PTSD victims, of particular interest for the scope of the present study are the biological formulations cited there. Chapter III presents the method of investigation, including procedures used and methods of data analysis, a description of the samples of veterans and the instrument of examination, the HRNTB. Chapter IV presents the results of the tests and interviews, and the final chapter discusses the findings, with proposals for further investigation.

CHAPTER II

CLINICAL FEATURES; DIAGNOSTIC AND ETIOLOGICAL ISSUES OF COMBAT-RELATED PTSD

2.1 Introduction

In this chapter, clinical features of combat-related post-traumatic stress disorder are discussed, in terms of current diagnostic categories as outlined by the American Psychiatric Association's (1987) Diagnostic and Statistical Manual (DSM-III-R). Differential diagnoses of the disorder are also presented. The literature dealing with issues of diagnosis, the various theories of post-traumatic stress disorder etiology, drawn largely from the biological and psychosocial domains, and some treatment consequences are presented.

2.2 Clinical Features of PTSD

Post-traumatic stress disorder presents a complicated clinical picture as part of the response to traumatic events. A broad variety of symptoms is usually found, including anxiety, phobic fears, irritability, belligerence, fatigue, psychosomatic complaints, and depression, as well as the more PTSD-specific symptoms of nightmares, flashbacks, difficulty concentrating and excessive startle response. Symptoms of the disorder, whose onset in its delayed form may be experienced from six months to ten years after exposure to combat (Watson, Kucala, Manifold, Vassar, & Juba, 1988), are identified in DSM-III-R (1987) as a disorder found among many survivors of a "psychologically distressing event that is outside the range of usual human experience" (American Psychiatric Association, 1987, p. 236).

There is some evidence that post-traumatic stress disorder symptomatology is more frequently perceived post-war (Hourani, Armenian, Zurayk, & Afifi, 1986). In the victim, the trauma is re-experienced by recurrent or intrusive recollections of the event, or by sudden feelings of being emotionally overwhelmed, often released by triggers in the local environment, such as contemporary music, the sounds of a helicopter, vehicular backfires, the smell of burning diesel fuel, even the contour of the surrounding landscape. Media presentations of war topics, anniversaries of individual departure or return dates, or the dates of specific combat operations (e.g. the February, 1968 Tet offensive), even reunions with former combat buddies are reported by clinicians to have elicited symptoms among their post-traumatic stress disorder clients. For some, indeed, such re-emergence of post-traumatic symptoms can lead to their serious exacerbation, such as a veteran cited by Lipper, Davidson, Grady and Edinger (1986), whose visit to the Washington memorial to the Vietnam war resulted in an acute onset of symptoms, and required the veteran to be re-hospitalized.

Post-traumatic stress disorder symptoms, as outlined by DSM-III-R (see above), have been corroborated by several investigators, and will be selectively elaborated below

(Bleich, Siegel, Garb, & Lerer, 1986; Boman, 1985; Card, 1987; Centers for Disease Control, 1988; Glover, 1984; Healy, & Williams, 1988; Hendin, 1984; Jordan, How, Gelsomino & Lockert, 1986; Horowitz, 1983; Kinzie, Fredrickson, Fleck & Karls, 1984; Krystal, 1986; Langley, 1982; Laufer, Brett, & Gallops, 1985; McGee, 1984; Mueser & Butler, 1987; Shalev, Attia, Bleich, Shulman, Kotler, & Shahar 1988; Shelton, 1984; Spiegel, 1984; Stellman, Stellman, & Sommer, 1988; Stretch, 1986; True, Goldberg, & Eisen, 1988; Van der Kolk, 1985; Van Kampen, Watson, Tilleskjor, Kucala, & Vassar, 1986; Woolfolk, 1988; Yager, 1984).

Although post-traumatic stress disorder symptomatology among civilians is not the main focus of this investigation, selected references reflecting the accumulating information about the disorder from the following trauma are provided: battering (Kim, 1987; Lindberg, & Distad, 1985); collision at sea (Hoiberg and McCaughey, 1984); industrial accidents (Peck, 1984); holocaust victims (Askevold, 1977; Shatan, 1985; Solomon, Kotler, & Mikulincer, 1988); second generation effects (Rosenheck, 1986; Sigal, DiNicola, & Buonvino, 1988); motor vehicle accidents (Kuch, Swinson, & Kirby, 1985; Singer, 1983); nuclear plant disaster (Bromet, Schulberg, & Dunn, 1982); natural disaster (Newman, 1977; Penick, Powell, & Sieck, 1976; Quarantelli, & Dynes, 1977); among vocational groups like police (Martin, McKean, & Veltkamp, 1986; Stratton, Parker, & Snibbe, 1984), nurses

(Resick, 1986; Stretch, 1985) and firefighters (McFarlane, 1988); and prisoners of war (Kinzie, Fredrickson, Ben, Fleck, & Karls, 1984; Klonoff, McDougall, Clark, Kramer, & Horgan, 1976; Kluznik, Speed, Van Valkenburg, & Magrav, 1986; Tennant, 1986; Tennant, 1987; Ursano, Boydstun, & Wheatley, 1981).

2.2.1 Associated Features

A majority of veterans with post-traumatic stress disorder have a concurrent psychiatric diagnosis (Davidson, Kudler, & Smith, 1987). Burke and Mayer (1985) found that the Minnesota Multiphasic Personality Inventory (MMPI) profiles of 30 veterans (mean age 33.4 years), diagnosed as having post-traumatic stress disorder, showed "practically identical" profiles with those of 30 newly admitted patients. The profiles showed severe emotional disturbances consistent with a psychotic diagnosis. In an earlier study, Keane, Malloy and Fairbank (1984) had found that veterans with chronic post-traumatic stress disorder show a Minnesota Multiphasic Personality Inventory profile with many scales elevated, including a conspicuous 8/2 ("Schizophrenia/ Depression"). They compared the responses of three different groups of Vietnam-era veterans on the Minnesota Multiphasic Personality Inventory: (a) Vietnam combat veterans with a reliable diagnosis of post-traumatic stress disorder, (b) well-adjusted Vietnam combat veterans, and (c) Vietnam-era veterans with psychological problems other than post-traumatic stress disorder. Their investigations yielded significant differences on scales 1 (Hypochondriasis), 3 (Hysteria), and 7 (Psychasthenia). A discriminant analysis correctly classified, by group, 83% of the subjects in the study. Foy, Sipprelle, Ruger, and Carroll (1984) reported similar results in their study of post-traumatic stress disorder in Vietnam veterans. The difficulty of distinguishing post-traumatic stress disorder symptomatology from psychoses will be discussed below. According to DSM-III-R, the neurotic symptoms of depression and anxiety are more commonly found among victims of post-traumatic stress disorder, and as Blanchard, Gerardi, Kolb, and Barlow (1986) found, sometimes complicated by painful guilt feelings. Moreover, the symptoms can be tenacious and unvarying, as Merbaum (1977) found in an examination of 17 psychiatric casualties of the Yom Kippur war, one year after their release from hospital: Minnesota Multiphasic Personality Inventory measures yielded no significant differences from time of admission, and the author inferred that the degree of emotional distress experienced by these veterans continued to be extraordinarily high, characterized by extreme depression, anxiety and extensive physical complaints.

The Centers for Disease Control Vietnam Experience Study (1988) of 7,924 randomly selected Vietnam veterans, found that a larger proportion of Vietnam than non-Vietnam veterans showed Minnesota Multiphasic Personality Inventory indications of psychological problems. Significantly more

Vietnam veterans had elevations on scales 1, 2, 3, and 7 (which provide the MMPI's best indication of anxiety, somatization, and depression) as well as on scale 8 (which indicates unusual thoughts or behaviors, usually related to distress or psychopathology). Other clinical scales, including 4 and 9 (which are commonly associated with characteristics of addictive or antisocial personality) and 5 and 0 (both of which are of little clinical relevance), did not differ between Vietnam and non-Vietnam veterans. Overall, about half the participants in each group showed no elevation on any clinical scales, but elevations on two or more clinically relevant scales (scales 1 through 4, and 6 through 9) were significantly more frequent among Vietnam veterans.

2.2.1.1 Symptoms of Depression and Anxiety

Post-traumatic stress disorder includes features characteristic of depression. A high percentage of patients who meet criteria for post-traumatic stress disorder also meet the criteria for major depression (Healy & Williams, 1988; Rosenbluth, 1984; Walker, 1982). The Centers for Disease Control Vietnam Experience Study (1988) of 7,924 randomly selected Vietnam veterans, found 4.5% of veterans to be suffering from depression and 4.9% from anxiety. Sixty-six per cent of veterans who met criteria for PTSD were also more likely to be experiencing depression or anxiety. Friedman (1981), in a more general review of PTSD in Vietnam veterans, cites a higher incidence of depression in combat veterans. A "probable depressive syndrome" was found in 18 percent of all combat veterans in a study by Helzer, Robins, and Davis (1976), compared to only 5 percent of non-combat veterans. Symptoms include typical vegetative signs, such as sleep or appetite disturbances, including recurring nightmares of combat, depressive--often ruminative--ideation, including possible suicidal ideas, feelings of helplessness, apathy, dejection, loss of initiative, and psychomotor retardation (Lehmann, 1985, p. 671). Keane, Wolfe and Taylor (1987) found that psychic or emotional numbing of responses, with decreased feelings of intimacy or enjoyment of activities, as well as a heightened startle response were common phenomena among veterans with post-traumatic stress disorder.

Alexithymia is reported as a frequent component in the symptoms accompanying depression among veterans. Krystal, Giller, and Cicchetti (1986) compared ratings on four scales of alexithymia among Vietnam-veteran post-traumatic stress disorder inpatients, non-veteran somatic inpatients on a medical service and non-veteran psychiatric inpatients with affective disorders, and found that the affective patients were least effected by alexithymia. Shipko, Alvarez, and Noviello (1983) regard the emotional numbing of alexithymia as, at least in part, a volitional defense mechanism. Several subjects in their investigation could clearly identify the incident which resulted in a conscious decision to suppress the experience of emotion. The authors posit that such patients make poor candidates for insight-oriented psychotherapy. The authors may, however, be underestimating the hot-house effect of military conditioning during combat training, which actively discourages the unrehearsed expression of private feelings, like grief and interpersonal intimacy (Shatan, 1985). The preferred public expressions among leadership candidates in most schools of arms in the free world tend to fall between bonhomie and bravura. The resulting guarded attitude toward the expression of negative feelings may therefore be less clinically significant than implied by Shipko et al.

Anger and rage form a particularly frightening behavioral response picture among veterans with post-traumatic stress disorder. Indeed, the marginally civilized, violence-prone veteran has become a caricature and fixture among entertainment anti-heroes, with a consequently deviant image in much of the lay public mind. To be sure, rage responses--if only pro forma--are an integral part of basic and advanced combat training, such as practiced in bayonet training, assault courses, hand-to-hand combat, "house-clearing" operations, and other squad- or platoon-sized field tactics. Guerilla combat, in addition, exposed these young men to sudden, surprising, often ferocious ambushes that left them shaking with a rage many never experienced before, with no suitable targets on which to vent their feelings (Shatan, 1978). While some depressed individuals may inhibit their aggressiveness, others appear more easily to express themselves aggressively. Not surprisingly, a preoccupation with violent fantasies or behavior is often seen in Vietnam veterans suffering from post-traumatic stress disorder (Feldmann, 1988). This consequence leads many to question their sanity, often expressing horror over their own behavior. Many sublimate their rage by breaking inanimate objects, while others have learned to neutralize rage attacks by abandoning the site.

Guilt feelings over having participated in the Vietnam war can be a latent component of depression. On a broad political scale, one Veterans' Administration study (1980) showed more younger veterans openly disapproved of their country's involvement (about 33%), expressing shame and guilt, than was assumed to have been the case in previous wars. Personal guilt for having survived, however, is an inevitable consequence of war-related trauma, and may become exacerbated to resemble an agitated depression (Glover, 1984). Often, symptoms include having dreams of the veteran's comrades dying in battle, and avoiding interpersonal intimacy because of the fear that one may be abandoned. Guilt feelings can also be made worse by the victim having undertaken almost any defensive measure to ensure survival (Glover, 1985), perhaps at cost to others, such as withdrawal from a fire-fight position, even under orders (Williams, 1987, p. 79). False rationalizations are a key feature of survivor guilt ("If only I had/hadn't, etc.") and are shown repeatedly in the literature to permit the survivor to avoid the facts of the trauma (Williams, 1987, p. 77).

Moreover, and consistent with pre-combat military training, the combatant's ability to dehumanize the enemy (e.g., the now-infamous term "gook" became synonymous with Asian), while designed to inoculate the combatant against the dissonance of killing, may have served only temporarily to extinguish such dissonance and paradoxically to sensitize the veteran to delayed post-traumatic stress disorder. Exposure to abusive violence, indeed, has emerged as a highly significant predictor of post-traumatic stress disorder. Breslau and Davis (1987b) found that participation in acts of abusive violence conferred a stronger risk for PTSD than did other aspects of war zone stress. Yager, Laufer and Gallops (1984) found that experiences of atrocity in war were associated with a greater use of heroin and marijuana, some 15 years after the veterans in their sample had left the service. Veterans who experienced no combat and did not take part in atrocities, however, did not differ appreciably from nonveterans. Glover (1985) found that combat soldiers who willfully killed Vietnamese civilians and later experienced guilt frequently manifested signs of depression, paranoia, or aggression.

Moreover, though depression is common to post-traumatic stress disorder, it has been found that anxiety is frequently an accompanying symptom of the disorder, and likely has an endogenous component (Blanchard, Kolb, Pallmeyer, & Gerardi, 1983; Gray, 1985; Lesse, 1982; Warneke, 1984). Warneke (1984) writes that panic attacks are frequently a hallmark once the illness becomes established. Lesse (1982) argues for a symptom pathway, beginning with a stressor, leading through anxiety and terminating in depression, often of a masked type. Anxiety is also closely allied to fears (Gray, 1985; Lesse, 1982), and veterans with post-traumatic stress disorder frequently cite specific fears associated with combat experiences, such as the terror from snipers, booby traps and "friendly fire" (erroneously targeted American fire, often from remote sources, such as artillery or offshore naval gunfire. Blanchard, Gerardi, Kolb, and Barlow (1986) constructed an Anxiety Disorders Interview for use by novice interviewers, and found anxiety to be a reliable diagnostic category in this disorder. Similarly, Foy, Sipprelle, Rueger, and Carroll (1984) discovered that a problem checklist with items indicative of anxiety-based disorders, particularly generalized anxiety and pervasive disgust, formed a discriminant function that correctly classified more than 90% of their 43 study subjects.

2.2.1.2. Symptoms of Hypochondriasis

There is an abundance of research that has documented the seemingly causal relationship between stress and illness among the general populations (see Dean & Lin, 1977). Laufer, Brett, and Gallops (1985) also reported that

Vietnam veterans, particularly combat veterans, show an increased number of medical problems when compared to Vietnam-era veterans. Interest in this topic has been linked to concerns over the possible toxic sequelae of dioxin-contaminated herbicides (such as Agent Orange) in widespread use as a tactical defoliant in south-east Asia.

Levy (1986) tested six Vietnam combat veterans with active cases of chloracne (a medical indicator of exposure to Agent Orange) with several neuropsychological tests (Wechsler Adult Intelligence Scale - Revised, Rey Auditory Learning Test, Symbol Digit Modalities Test and the Word Fluency Test: all tests being sensitive in a non-specific way to cerebral dysfunction), and compared them with 25 controls, matched for age, education, time of service in Vietnam (between 1964 and 1970, the period of spraying) and level of combat exposure (a minimum of two enemy contacts per week for each of four successive weeks). Levy found that the exposed Vietnam veterans, in contrast to the control group, showed a significantly higher rate of post-traumatic stress disorder symptoms, including cognitive impairments, depression, anxiety and aggressiveness. He concluded that exposure to Agent Orange appears to increase the prevalence of PTSD.

Perceptions of ill health were found to be correlated to the presence of post-traumatic stress disorder. Stretch (1986) found highly significant positive correlations between "psychosocial health problems indicative of PTSD" and self-perceived physical health problems. Questionnaire items dealing with psychosocial matter were based on DSM-III criteria, and included (1) bad memories about Vietnam experiences; (2) sleep disturbances (bad dreams or nightmares); (3) ability to express feelings to those cared about; (4) ability to feel and express emotions ("numbness"); (5) ability to concentrate and (6) feelings of guilt over having survived Vietnam.

Solomon and Mikulincer (1987), in their investigation of somatic complaints among Israeli soldiers, examined the effect of combat stress on somatic health in a sample of 804 Israeli soldiers (median age 28.5) one year after the Lebanon war. Their results indicate that participation in combat _per se_ did not have pathogenic effects. However, combat stress reactions and PTSD were found to be associated with somatic complaints.

Staudenmayer and Selmer (1987) found delusions of ecological disease (based on the presupposition that psychological and/or physical symptoms are the result of allergy or intolerance to environmental agents, namely foods or chemicals), among Vietnam veterans suffering from PTSD, and accompanied by feelings of helplessness and powerlessness.

2.2.1.3 Cognitive Disruptions

Post-traumatic stress disorder cognitive disruptive symptoms typically include those consistent with reactive depression, i.e., negative self-image, low self-esteem, memory impairments, difficulty concentrating and slowed thinking, including indecisiveness, and psychomotor retardation (Leber, Beckham, & Danker-Brown, 1985, p. 365). As well, cognitive symptoms associated with anxiety disorders may be implied, such as obsessive thoughts, spontaneous panic attacks, hysterical symptoms and phobias (Lehmann, 1985, pp. 670-627). Often an endogenous disorder, anxiety symptoms can be triggered by external events, as Fairbank, Keane, and Malloy (1983) found, when they used tests that included the Minnesota Multiphasic Personality Inventory, the Spielberger State and Trait anxiety inventories, the Beck and Zung depression scales, and the Fear Survey schedule, when discriminating PTSD from non-PTSD veterans.

Post-traumatic stress disorder veterans were more frequently incorrect in their recognition of a range of normally encountered interpersonal affect (e.g., angry, sad, matter-of-fact, and disgusted), in a study by Keane, Wolfe and Taylor (1987), indicating a likely deficit in their ability to respond appropriately to complex interpersonal situations and reflective of social alienation. Moreover, the PTSD veterans displayed impairment on a continuous performance test of attention, a finding that documents PTSD patients' often-reported problems with concentration. On a memory task of immediate recall of paragraphs, patients from the PTSD and non-PTSD groups performed comparably well. Factor-analytic support for DSM-III's symptom list, including memory or concentration difficulties, were found by Silver and Iacono (1984) among 405 veterans.

Klonoff, (1976), contrasted neuropsychological results (using the Halstead-Reitan Neuropsychological Test Battery, see 3.5.1, below) of two groups of Canadian WWII prisoners, a "high stress" group interned by the Japanese after the fall of Hong Kong, and a "low stress" group held by the Germans. The high-stress group's performance was significantly worse on two variables, measures of attention and concentration in visuo-spatial concept formation (Halstead's Category test); and in auditory channels (Seashore rhythm test), with the Speech Sounds Perception test approaching significance (Klonoff, 1976, p. 248). The generally lower performance of the high stress group on the HRNTB was shown also by their significantly lower score on the Impairment Index. Similar results were found in a test of psychomotor speed, visual scanning, and the ability to progress in sequence (Trail-Making test, parts A and B). The more stressed of the two groups were significantly weaker in their responses to Part B, a test of alternative number-to-letter sequencing, typically held to be more difficult than Part A, in which sequencing only of numbers is required. There was also a significant difference in overall cognitive efficiency between the two groups (in terms of their Wechsler Full Scale I.Q. scores), with the high stress group scoring some seven points below the low stress group (111.1 and 118.3, respectively). Klonoff

(1976) makes the "reasonable" assumption that both groups were of equivalent ability before and during their stressful experiences, but that long-term effects--their measures were taken some thirty years later--of the POW's differentially-stressed incarcerations could result in such "dramatically" decreased cognitive skills.

2.2.1.4 Psychotic Features

The most frequently cited psychotic feature, and the most problematic symptom of post-traumatic stress disorder victims is that of the "relived experience," or "flashback" involving combat scenes (Brett, & Mangine, 1985; Burstein, 1985; Cohen, 1977; Holloway, & Ursano, 1984; Keane, Wolf, & Taylor, 1987; Kolb, 1986; McGee, 1984; Mellman, & Davis, 1985). The symptom is not restricted to Vietnam veterans, and several investigators (Brockway, 1988; Hendin, Haas, Singer, Houghton, Schwartz, & Wallen, 1985) cite evidence for flashbacks among WWII veterans. Hendin et al. (1985) report that of the more than 100 PTSD cases with whom they have worked, about 20% have had episodes in which they suddenly acted or felt as if traumatic events which they had experienced in Vietnam were recurring. In almost every case such episodes were repetitive across a period of time ranging from a matter of weeks to several years. Clinical reports from Vet Center therapists corroborate the longevity and, particularly, the freshness, of the relived experience of veteran clients in their care. They suggest that the fatigue and threatening environment encountered by soldiers during combat produce alterations of consciousness and contribute to their subsequent inability to integrate the trauma with the rest of their lives. Indeed, subject-clients in the present investigation who have participated in exchange visits with Soviet Afghan war veterans report striking similarities of possibly symbolic relevance among the contents of relived experiences by both Russian and American veterans, such as being pursued, ambushed, or mortally wounded. Hendin et al. (1985) suggest that the paucity of well-developed case material has limited our understanding of the psychodynamics of this phenomenon.

In civilian life, the alteration of consciousness seen in fugues and multiple personalities seems to have some similarities to what occurs in combat-related reliving experiences, with the striking difference that the combat veteran usually does not assume another identity during such episodes. Among other investigators, Cohen (1977, 1984) and Siegel (1977, 1978) trace the more recent emergence of flashbacks among the youthful civilian population to the increasingly widespread use of hallucinogenic substances. Flashbacks are visual and emotional phenomena that suddenly appear days, weeks, or months after the last ingestion of a hallucinogen; they disappear gradually, but have been known to last for years. Among his subjects, Cohen (1977) noted certain factors as commonly associated with the onset of flashbacks: high levels of psychological and emotional arousal, such as during stress, and diminished sensory input and ego control, such as caused by fatigue.

Goodwin (1987, p. 13) cites several common, everyday experiences that can trigger an obsessive flashback for the veteran: helicopters flying overhead, the smell of urine (corpses have no muscle tone, and the bladder evacuates at the moment of death), the smell of diesel fuel (used in commodes and latrines for burning), green tree lines (searched for irregularities indicating possible enemy presence), the sound of popcorn (similar to small arms fire at a distance), any loud discharge (such as vehicular backfire), 1960's popular music, or a rainy day (it rains for months during the monsoons in Vietnam).

Brett and Mangine (1985) corroborated the relationship between the degree of stress and posttraumatic imagery among veterans. Mellman and Davis (1985) noted in their sample of 25 veterans with post-traumatic stress disorder that flashbacks were related to combat stressors, such as exposure to extreme danger and major losses. Flashbacks began a year or more after exposure to combat in 50% of patients, with 56% of patients experiencing daily episodes. Loud noises, fatigue and personal stress tended to precipitate flashbacks. Although many sensory and cognitive cues can elicit flashback phenomena, olfactory precipitants appear to heighten the vividness of the experience (Kline, 1985).

Flashbacks were investigated by McGee (1984) as a memory phenomenon, in which subjects with drug-induced flashbacks were engaged in a "cued retrieval" experiment. The author suggests that flashbacks might be better seen as one of a number of "non-pathological" influences on memory processes, such as dream recall, post-traumatic stress disorder, mood and drugs. Rainey, Aleem, Ortiz, Yeragani, Pohl, and Berchou (1987) administered infusions of lactate intravenously to seven patients with PTSD, of whom six also met DSM-III criteria for anxiety. The lactate infusions resulted in flashbacks for all seven patients and panic attacks in six patients. The authors conclude that with further development, intravenous lactate infusion may be used to study flashbacks and other dissociative phenomena and to determine the relationship between flashbacks and panic anxiety.

Neurologically, visual hallucinations are generally seen as consequences of temporal lobe function. Moreover, some evidence exists that the right hemisphere is more clearly linked to visual hallucinations. In his now classic neurosurgical examinations during the late 1950's, Penfield electrically stimulated various points on the temporal lobe in awake patients prior to the removal of diseased epileptic tissue. The hallucinations had a rather startling feature: The patients reported that the experience was remarkably real, almost as if they were reexperiencing a past event. The evocation of complex experiential phenomena was found only after stimulation of the temporal lobe, and were not reported following stimulation of other cortical areas (Kupferman, 1982).

Visual hallucinations are often found as consequence of organic brain disease, with possible psychiatric sequelae, such as the organic psychoses (Friedman, Kaplan, & Sadock, 1985). Moreover, while it is possible to hallucinate following left hemisphere damage, visual hallucinations are more likely found following right brain injury (Hecaen & Albert, 1978; Lance, 1976; Teuber, 1962). In Penfield's experiments, for instance, visual hallucinations were more strongly lateralized than auditory hallucinations and they showed clear right hemisphere emphasis (Gill, 1989).

Auditory hallucinations also plague some veterans with PTSD. In an investigation of intrusive auditory perceptions, Mueser and Butler (1987) found that PTSD veterans experiencing auditory hallucinations had higher combat exposure and more intense PTSD symptoms than nonhallucinating veterans. These veterans also appeared to be more refractory to treatment than veterans with no hallucinations. That auditory hallucinations may also have an organic etiology may be inferred from the above experiments of Penfield: Stimulation of the primary auditory areas of the temporal lobe produced crude auditory sensations. In contrast, stimulation of the superior temporal gyrus produced alterations in the perception of sounds, including auditory illusions and hallucinations (Kupferman, 1982).

More elaborate and debilitating defenses may be seen among veterans who develop psychotic reactions along with PTSD symptoms (Boman, 1986). Indeed, diagnostic confusion can result, given a similarity of symptoms between the two conditions (Domash, 1982). McFarland (1985) found that in a sample of 58 inpatient veterans with PTSD, in terms of DSM-III Axis I diagnoses, that 8.6% had PTSD as a sole diagnosis, 43.1% had two diagnoses, 36.2% had three diagnoses, and 12% had four or more diagnoses.

Hendin (1984) reports frequently observed paranoid responses, in the forms of mistrust, proneness to take offense and restricted affectivity, and relates these phenomena integrally to the meanings that combat experiences have had for these veterans. Both in combat and in their postwar civilian lives, rage and the readiness to counterattack serve to repress fear and vulnerability, and to deny guilt feelings.

Spiegel (1984) discovered many aspects of the phenomenology and treatment of multiple or dissociative personality disorder (MPD) that are reminiscent, in more extreme forms, of post-traumatic stress disorder. He discusses their high hypnotizability and their profound capacity to dissociate spontaneously to protect themselves from emotion and physical pain. Victims of trauma experience themselves as helpless, with a mental state of surrender and cognitive constriction. The helplessness becomes internalized, and the patient feels helpless not only in controlling his environment but his own state of mind as well. Similar to the defenses seen among civilian victims of criminal assault (Coons, 1984), when one personality "takes over" another, the patient remembers and repeats the earlier trauma through a self-imposed sense of helplessness and demoralization. At the same time, the dissociation is a defense, and the patient guards against the painful affect with a sense of spatial and temporal fragmentation. Paradoxically, the dissociation both perpetuates the pain and protects the patient from it.

PTSD is distinguished from the psychoses by generally intact ego controls that allow the patient to differentiate fantasies and delusions from reality (Krystal, 1982).

Factitious, or sham presentations of PTSD symptoms have also been reported. Perhaps as consequence of an unprecedented media coverage of both the war and readjustment difficulties of Vietnam veterans. Lynn and Belza (1984) present seven cases of factitious PTSD, deception among veterans who were never in combat, which is ascribed by the authors to either Munchhausen's syndrome or malingering.

2.2.1.5 Interpersonal and Social Symptoms

Post-traumatic stress disorder may have a prolonged effect on personality development, patterns of adjustment, coping styles and interpersonal functioning (Goodwin, 1987).

Vietnam veterans are known to have increased levels of alcohol and drug abuse problems, marital difficulties, poor work histories, and legal entanglements. Interpersonal symptoms include very high frequency of difficulties establishing or maintaining emotionally intimate relationships. For instance, about 38% of those veterans married before going to Vietnam were divorced within 6 months of their return. Families are vicariously exposed to the effects of catastrophic stress on the survivor and his abreactions, such as boundary distortions of intimacy and separation, or the somatization of rage and grief (Rosenthal, 1987). Marked resistance to self-disclosure on the part of the veteran seriously impairs marital communications (Shehan, 1987). Of those combat veterans who went to college, only 43% completed one year, while 50% of nonveterans graduate. More than 53% of Vietnam veterans did not return to any school. While blacks constituted about 15% of infantry units, and up to 25% of elite airborne units, unemployment among black Vietnam veterans is three times that of black veterans who did not serve in Vietnam (Jordan, Howe, Gelsomino, & Lockert, 1986).

A significant number of veterans have run afoul of the law, though Jordan, et al. (1986) found that while about one-third of the United States federal prison population was made up of veterans, 70% of these incarcerated veterans had honorable discharges, suggesting that these individuals were not necessarily delinquent. Although the writer has found no Canadian case or statute law to date in the legal literature using combat-related post-traumatic stress disorder as defense against a criminal charge, PTSD had been sought as a defense in nearly two dozen American cases involving Vietnam veterans by 1980 ("Pleading PTSD," 1980). Moreover, the relationship between combat stressors, PTSD symptomatology and the tendency to commit criminal acts has been widely explored (Daniels, 1984; Erlinder, 1983; Jordan, Howe, Gelsomino, and Lockert, (1986); Marciniak, (1986).

Symptoms of post-traumatic stress disorder are seen by Jordan et al. (1986) as interfering with vocational and family life with potentially such severity that, in cases involving episodes of psychosis, an "insanity plea," or a defense of "unconsciousness" might be raised. They have found, in their experience, most courts to be "eager for and responsive to the educational efforts and individual recommendation plans devised by the expert witness/consultant" (p. 126). Such a defense, however, is fraught with symptom confounders such as their subjectivity, lack of specificity and ready fabrication due to their widespread knowledge and Sparr and Atkinson (1986), argue that the competent forensic evaluation of veterans who raise the issue of post-traumatic stress disorder as defense will require special clinical techniques. In the view of Lipkin, Scurfield, and Blank (1983), such an examination must include establishing a relationship between the criminal act of the defendant veteran and his exposure to the psychological trauma of war. A special emphasis on legal dispositions and treatment implications is also required in such an undertaking. The authors conclude that not all criminal acts committed by combat veterans can be explained by exposure to the psychological trauma of war. For instance, the defence of PTSD did not suffice to earn an acquittal in a murder trial (Grant & Coons, 1983), despite the undisputed presence of the disorder, for the apparent reason that it was not able to be linked to the circumstances of the crime. Indeed, Packer (1983) concludes outright that in most cases the insanity defense with regards PTSD symptoms rests on invalid, deterministic reasoning and only in rare cases would an individual with PTSD experience a psychotic or dissociative episode and meet the criteria for legal insanity. He goes on to argue, however, that a treatment recommendation is frequently accepted by the courts.

Wilson and Zigelbaum (1983) found that the disposition to criminal behavior is determined by whether or not the veteran enters into the survivor mode of functioning as a behavioral defense mechanism against the disorder. They argue for a relationship between the severity of post-traumatic stress disorder, as determined by combat role variables, and exposure to stressors in war, and the tendency to commit illegal acts.

2.2.1.6 Substance Abuse

Substance abuse, mostly of alcohol and marijuana, was quite widespread among active service personnel, particularly in the later stages of the war (MacPherson, p. 63). The British military historian and lecturer at Sandhurst, Keegan writes (1976) that alcohol was long "an inseparable part both of preparation for battle and of combat itself. Alcohol...depresses the self-protective reflexes and so induces the appearance and feeling of courage. Other drugs reproduce this effect, notably marijuana; the American Army's widespread addiction to it in Vietnam, deeply troubling though it was to the conscience of the nation, may therefore be seen, if not as a natural, certainly as a time-honored response to the uncertainties with which battle racks the soldiers" (p. 376).

The use and abuse of alcohol and drugs among Vietnam veterans has become formidable. Blum, Kelly, Meyer, Carlson, and Hodson (1984) found a significantly higher rate of alcohol and drug use in a sample of 210 Vietnam veterans than in a similar number of Korean and World War II veterans, both during and after the war. Also comparing Vietnam and Korea war veterans, Branchey, Davis, and Lieber (1984) found that one-third of patients attending clinics that were not devoted to the treatment of alcoholism had alcohol-related problems. They found this to be far in excess of general population prevalence estimates. A significant association was found between combat exposure and excessive alcohol use. Close to 60% of a group of veterans exposed to combat drank excessively at the time of their study, versus only 25% of a group of non-combat veterans of the Vietnam and Korean eras.

The coexistence of post-traumatic stress disorder and alcoholism appears also to be substantial, with a study by Sierles, Chen, McFarland, and Taylor (1983), reporting 17 of 25 PTSD patients to have concurrent alcoholism. The Centers for Disease Control Vietnam Experience Study (1988) of 7,924 randomly selected Vietnam veterans, found 39% of PTSD patients among veterans to be abusing or dependent on alcohol. A further study (Lindy, Grace, & Green, 1984) of two populations of Vietnam veterans, one in treatment and the other attending an outreach center, showed that of 48 total subjects, with almost 75% diagnosed as having PTSD, almost half of the 48 also met the criteria for substance abuse (with about one third of the 48 abusing alcohol only). Keane (1984) found that of 40 self-referred veterans to a Veterans Affairs hospital, 63% reported heavy and often abusive consumption of alcohol. The use of narcotics and other more frequently abused drugs was reported as minimal.

The coexistence of post-traumatic stress disorder and substance abuse can also lead to diagnostic uncertainty. Van Kampen, Watson, Tilleskjor, Kucala, and Vassar (1986) evaluated, among alcoholic veterans, the validity of DSM-III elements used to define PTSD. They found that elements dealing with the reexperiencing of traumas, diminished pleasure, detachment from others, hyperalertness, sleep disturbance, guilt over behaviors required for survival, and avoidance of stimuli reminiscent of traumas showed substantial correlations with eligibility for a PTSD diagnosis. However, items dealing with emotional expressiveness, response to intimacy, survival guilt, impaired memory and trouble concentrating, either failed to correlate with qualification for a PTSD diagnosis or yielded marginal results.

Lacoursiere, Godfrey, and Ruby, (1980) discussed the possible etiology of alcoholism among Vietnam veterans: Alcohol abuse may result from self-medicating the pain of the traumatic neurosis over time. Lindy et al. (1984) suggest that self-medication with alcohol or drugs is designed to manage the intrusive symptoms. Krystal (1984) expressed the belief that post-traumatic stress disorder patients who develop a dread of the more expressive elements of emotion and who strive to block these and their dreams by any possible means have a propensity to alcohol and drug abuse.

2.3 Diagnostic Issues

Occasionally, post-traumatic stress disorder is confused for other psychiatric disorders. In his follow-up investigation of the Battle Creek flood survivors, Lucking (1986) found three 33-39 year old males with a primary diagnosis of post-traumatic stress disorder and an unrecognized coexisting diagnosis of bipolar disorder. Lucking cites an underdiagnosis and undertreatment of coexisting disorders as frequent in the literature and suggests that refractory PTSD symptoms may include a bipolar disorder.

As Walker (1981) has noted, post-traumatic stress disorder is often erroneously diagnosed as antisocial personality disorder, likely due to its inclusion of such maladaptive behaviors as "substance abuse, marital problems, poor work history, academic failure and legal entanglements." He also notes the difficulty of differentiating a case of PTSD and the individual with an antisocial personality who is mimicking the symptoms of PTSD. An extensive history of a PTSD victim, however, will typically reveal no signs of antisocial behavior before the age of 15, such as truancy, substance abuse, theft, fighting, casual sexual liaisons and chronic violation of rules (Jordan et al., 1986). PTSD is distinguished from character (sociopathic) disorders in several ways: heightened emotional sensitivity, including empathic responses; lack of behavioral exploitativeness; the experience of guilt and anxiety; positive responses to therapy; and self-destructive, self-defeating and anti-social behaviors are inconsistent (Jordan et al., 1986). In the case of civilian disasters, Shore, Tatum, and Vollmer, (1986), state that persons with pre-existing physical and mental health problems are thought to be at greater risk of emotional complications during and after such events. Results of a study by Foy, Sipprelle, Rueger, and Carrol

(1984), however, demonstrate that combat exposure and, to a lesser degree, adjustment to military routines away from combat zones were significantly related to PTSD symptomatology, whereas premilitary adjustment was not.

Since the Veterans Administration (VA) authorized compensation and other benefits for post-traumatic stress disorder in October 1980, the agency has received an increasingly large number of claims for the disorder. Atkinson, Henderson, Sparr and Deale (1982) address some common diagnostic pitfalls that have become a diagnostic bane for most veteran claimants and some clinicians:

(a) Though the DSM-III-R criteria for post-traumatic stress disorder can be operationally defined for use in a structured interview, yielding, as Davidson, Smith, and Kudler (1989) found, acceptable diagnostic validity, particularly in terms of depression and anxiety, there exists a professional bias against the diagnosis. The assumption is that a pre-existing condition is often confused for PTSD (Boman, 1986), but the unsupportability of this view is discussed in Section 2.4.1.

(b) There exists a professional resistance against DSM-III criteria, with examiners frequently complaining of the Veterans' Administration requirement of meeting all criteria listed in order to qualify for benefits (Laufer, et al., 1985). Platt and Husband (1986) argue that certain aspects of DSM-III criteria for either post-traumatic stress disorder or adjustment disorder should be reformulated to reduce the ambiguous classification of patients who fit some, but not all, of the the criteria for such diagnoses; and McFarland (1986) found in a sample of 58 30 to 51 year old inpatients treated on a post-traumatic stress disorder specialty unit that there was no clear-cut clustering of the diagnoses along DSM-III Axis I or Axis II lines. It could not be concluded that post-traumatic stress disorder was the prominent feature needing treatment in all cases.

(c) Atkinson et al. (1982) cite the difficulty of corroborating evidence for both premorbid adjustment and stressor event during combat. The specific role of these two etiological factors is discussed in Section 2.4.

(d) Some laconic veterans, called "silent" claimants by Atkinson, et al. (1982), despite having symptoms of post-traumatic stress disorder, are unable to communicate their feelings during interviews, and may become Type I errors.

(e) Due in part to widespread information about PTSD since the end of the war, some veteran claimants have tended to exaggerate or even falsify symptoms. Hyer, Fallon, Harrison, and Boudwyns (1987) discovered possible problems with the Minnesota Multiphasic Personality Inventory post-traumatic stress disorder scale related to symptom exaggeration (Section 1.4 above). Keane, Wolfe, and Taylor (1987) suggest a multiaxial approach to the assessment of PTSD, including the use of structured interviews, psychometric tests such as the Minnesota Multiphasic Personality Inventory, and a psychophysiological assessment procedure. Atkinson et al. argue for a prerequisite of a large case experience to sharpen clinical judgment of PTSD's subjective symptoms.

(f) Post-traumatic stress disorder symptoms can occasionally be cited by a patient, without intent to malinger, but without a clear "catastrophic" stressor on DSM-III-R Axis IV. Moreover, intervening events in civilian life since the end of the patient's service may have contributed to "stress." As noted, deviant behavior, such as violence or alcoholism are often diagnostic covariants, as are anxiety, depression, personality disorders or even psychoses.

Atkinson et al. again cite wide examiner experience with this population as the best means of distinguishing the valid claimant, and they offer some clinical insights. A full description of military stressors is typically required to form a pathway between the trauma and the PTSD. PTSD symptoms, moreover, must predate current life stresses. Flashback and dream content must be analyzed for war-related content. Violence, when an expression of PTSD, takes a stereotyped, dissociative form. Broyles (1986), MacPherson (1984), Mason (1983) and Shatan (1985) confirm, by individual anecdotes, a peculiarly masochistic quality to the veterans' fighting: Typically, the PTSD combat veteran will "pick" a fight with the biggest man in the house, apparently in order to assure losing the fight. Like an apparent need to maintain some PTSD symptoms for the need to atone private guilt, being physically abused may vicariously fill that need. Moreover, Atkinson et al. see alcohol abuse as a form of self-medication against the pain of relived trauma; however, it is usually unsuccessful (Lacoursiere, Godfrey & Ruby, 1980).

2.3.1 Stress Response Variations

That severely traumatic events occurring in adulthood might have psychological consequences which are prolonged is a relatively recent formal conceptualization. To be sure, most examinations of concentration camp victims since WWII typically address only the stress of being held prisoner, and exclude discussion of individual differences (Askevold, 1976; Shatan, 1985; Solomon, Kotler, & Mikulincer, 1988). The ambivalence surrounding the relative importance of trauma severity versus individual response differences is not adequately addressed by DSM-III-R. Green, Lindy and Grace, (1985) suggest that the nature of the trauma response is multiply determined. In their schema, the primary outcome determinant, or etiological factor, is the nature and intensity of the traumatic event. This will be seen to be consistent with DSM-III-R's diagnostic formulation of the stressor as lying "outside the range of usual human experience." Secondarily, Green, et al. postulate that the processing of the stressful event interacts with characteristics of the individual and those of the recovery environment.

The knotty problem of individual differences in response to combat-related stress is examined here, first from the perspective of a putative correlation between magnitude of stressor and victim response, and then from the perspective of individual response variations.

2.3.1.1 Stressor specificity

Krystal (1982) notes that in "twenty years' work" with holocaust victim-claimants he has been "unable" to correlate severity of stressor with severity of symptom response. To Krystal, it may be inferred, the lack of correlation between stressor specificity and the victim's relative response severity did not undermine the validity of the disorder. Breslau and Davis (1987a), on the other hand, take this lack of correlation to question the very existence of PTSD. In an examination of the literature on disasters, they conclude that there is as yet little empirical evidence on the validity of the DSM-III diagnosis of PTSD. They write (emphasis in the original):

> First, there are no grounds for isolating stressors on (the basis of linking a particular syndrome with a class of extraordinary stressors), since most persons exposed to events of the sorts included in the PTSD criterion [sic] do not show enduring psychological distress. Although people exposed to severe trauma exhibit signs of emotional upset, the immediate disturbance generally subsides and the rate of persistent symptoms is low.
>
> Second, the literature provides no evidence for the view that any given category of stressors is associated, causally, with a distinctive psychiatric syndrome. With respect to the **probability** of psychopathological response to stressors or the **form** of the response, personal and social factors exert an important influence. The likelihood of long-term

> psychopathological reactions is associated with preexisting personality characteristics or with the nature of the social environment of the survivors.
>
> Further, the response to extreme stressors takes many forms, pathological and nonpathological. Thus, although a high proportion of Vietnam combat veterans have exhibited marital conflict, alcoholism, drug addiction, or other psychiatric disorders, many veterans have demonstrated significant achievements in the occupational and political spheres. Extraordinary stressors are like more ordinary stressful events, for they, too, have a complex differential impact upon individuals. The similarity of the PTSD stressors to other stressful life events in this respect does not justify a qualitatively separate category (p. 262).

The authors go on to introduce, in an examination of the effects of wartime stressors in a sample of 69 Vietnam veterans who were psychiatric inpatients, the specific stressor of participation in atrocities and the cumulative exposure to combat stressors, each independently of the other, as conferring a significant risk for post-traumatic stress disorder (Breslau & Davis, 1987b). This important correlation was also found by Yager, Laufer, and Gallops (1984). In a further corroboration, Grady, Woolfolk, and Budney (1989) examined the responses of 142 Vietnam veterans on the Combat Scale Revised (CSR, Laufer, Yager, & Frey-Wouters, 1981) and the Vietnam Experience Scale (VES, Lund, Foy, Sipprelle, & Strachan, 1984). Both instruments include a variety of items that assess exposure to the armed strife and threat to safety present during combat (e.g., military roles, battlefield engagement, exposure to death or injury, being wounded, etc.). The VES includes one item that potentially relates to abusive violence. The authors found that participation in abusive violence was significantly related to postservice problems of adjustment and was the most powerful predictor for a diagnosis of combat-related post-traumatic stress disorder. They argue that the unidimensional models of war zone stress that focus exclusively on exposure to the threat of physical danger present in combat situations fail to characterize adequately important features of the Vietnam theater of war that are related to subsequent psychopathology. This appears to be consistent with the findings of Breslau and Davis (1987a).

While premorbid adjustment is discussed in Section 2.4.1, comorbidity issues have raised the question of overlapping diagnostic criteria between PTSD and other disorders. For example, diminished interest in significant activities, sleep disturbance, and impaired concentration are all symptoms of depression as well as PTSD, while hyperalertness and physiological reactivity are symptoms of anxiety disorders. Green, Lindy, Grace, and Gleser (1989) found that those combat experiences that contributed the most to a diagnosis of PTSD (with panic disorder) in any form were unit patrols (a measure of exposure to the life-threatening aspects of combat) and exposure to grotesque and mutilating death. With other stressors held constant, being a crew member of an offensive helicopter operation (as distinct from an air combat infantryman, en route to an engagement) contributed to decreased levels of the disorder, suggesting a protective function of distance from ground combat activities, or feelings of increased control over one's destiny.

2.3.1.2 Individual Response Differences

Hendin and Pollinger-Haas (1984) examined 10 veterans who did not develop post-traumatic stress after intense combat in Vietnam to explain what had protected them. The authors found a highly consistent adaptation to combat: During combat each of these veterans had exhibited calmness under pressure, intellectual control, acceptance of fear, and a lack of excessively violent or guilt-arousing behavior. To be sure, the list of qualities cited is consistent with the course of military training, whose stated goal is to remain competent in the face of battle. In some circumstances during training, moreover, some licence for the expression of fear is granted, but it is rarely encouraged, and few trainees will yield to this impulse. Hendin and Pollinger-Haas (1984) rightly believe that these traits may be part of an adaptation uniquely suitable for preserving emotional stability in an unstructured, unstable context.

2.4 Etiologies: Psychosocial

The arguments in the literature on psychosocial readjustment of Vietnam veterans is represented by mainly two theoretical camps. The first, known as the Stress Evaporation perspective, holds that the Vietnam veterans probably does suffer some psychological readjustment problems during and immediately after military service, but any problems have disappeared since returning home. Some representatives of this argument are Borus, (1974) and Helzer, Robins, and Davis (1976). These studies, as a group, found no significant differences between veterans who served in Vietnam and those who did not serve in Vietnam on a wide range of psychosocial behaviors. Their relatively early submissions to the research field of PTSD, predating its published diagnosis in DSM-III-R, with little attention to combat levels, leave these studies moot.

Contrasted to the Stress Evaporation perspective is the Residual Stress perspective which argues that the nature of the Vietnam combat experience has a significant impact on the veterans trying to readjust to civilian life. The five-volume report by the Center for Policy Research (1981) found that, controlling for combat experience, little difference was found between Vietnam-era veterans (who saw no combat) and civilian controls. Combat veterans, however, were found with significantly greater frequency to have substance abuse, legal and medical complications, political and social alienation and other stress symptoms in their lives (cf. Section 2.2).

Considerable discussion has surrounded the potential contribution to post-traumatic stress disorder of predisposing factors, primarily "personality" factors. Therapists' anecdotal reports are that often even former combatants have wondered aloud about the wide response range noted among their buddies to firefights or rocket attacks.

To be sure, the army's traditional compulsive attention to drill and detail of daily schedules during training, more than the stated purpose of minimizing the chaos and reducing error experienced by the troops during battle, thereby maintaining tactical cohesion, has the result of levelling of personality differences (Keegan, 1976). In some cases, such as the U.S. Marines, this purpose of reducing individual differences is overtly stated.

With the aim of systematizing clinical knowledge of stress response syndromes, Horowitz (1974) argues in his seminal study for delimiting personality responses to obsessional and hysterical neurotic styles, leading to treatment by crisis-oriented dynamic psychotherapy. Horowitz posits the psychiatric perspective of stress as an event that triggers internal responses and evokes potentially disruptive quantities or qualities of information and energy. He reminds us that, to Freud, traumatic events were repressed and yet involuntarily repeated in the form of hysterical symptoms, including compulsive repetition of trauma. (A classic example might be Lady MacBeth's despair at being unable to rid her hands of the "damned spot" of King Duncan's metaphorical blood.) A second common set of stress responses, according to Horowitz, includes ideational denial and emotional numbing, which he sees as defensive mechanisms. He writes that "tendencies to both intrusive repetition and denial-numbing occur in populations that vary in predisposition, after stressful events that vary in intensity and quality, and may occur simultaneously in a given person or in patterns of phasic alteration" (p. 789). Horowitz sees the oscillations of intrusion (nightmares, flashbacks, etc.) and avoidance symptoms as individual variances. For instance, intrusions, often accompanied by anxiety, may occur when individual defenses are let down. The intrusions are important representations of the traumatic event, and they break through because there is a need for their assimilation, to have them interpreted and understood. The avoidance symptoms (numbing, alexithymia, etc.) are a defense against the intrusions, slowing down the cognitive efforts at assimilation.

2.4.1 Premorbid Adjustment

The relationship of post-traumatic stress disorder to premorbid adjustment is perhaps the most complex of all issues surrounding this disorder. In a theoretical formulation of the validity of PTSD diagnosis as found in DSM-III, Green, Lindy, and Grace (1985) consider a number of possibilities with this relationship:

(a) Character pathology and diagnosis may be relatively independent, so that there is virtually no prediction from one to the other. People with and without character pathology would have an equal chance of developing PTSD.

(b) Character pathology may predispose individuals to develop PTSD and to maintain symptoms over time. Character pathology in this case would be seen as a vulnerability to trauma and would be expected to predate PTSD. This position seems to have been taken by the authors of DSM-III-R (American Psychiatric Association, 1987) who propose that "preexisting psychopathological conditions predispose to the development of the disorder" (p. 249). Davidson, Kudler, and Smith (1987) assessed personality variables of 30 patients with chronic post-traumatic stress disorder. World War II and Korean war veterans with PTSD were significantly more introverted and neurotic than age-matched non-psychiatric controls, whether or not the controls had been in combat. World War II and Korean war veterans also scored significantly higher than Vietnam war veterans with PTSD on both introversion and denial (lie) scales. Their investigations of World War II veterans with both short-term and long-term psychological problems after combat revealed that such individuals reported more frequent adolescent personality characteristics of introversion,negative introspection, proneness to hypochondriasis, and anxious rumination, that is, marked introversion and neuroticism. The Eysenck measures did not change during treatment of the patients. The authors indicated that PTSD patients were significantly more neurotic than were major depressives.

On the other hand, several investigators found no correlation between dysfunctional preservice history and the likelihood of post-traumatic stress disorder. Frye and Stockton (1982) used a self-assessment questionnaire to study 90 relatively affluent, well-educated combat veterans, selected from an Infantry Officer Candidate School class. Twenty-one were diagnosed as having PTSD, 19 were assessed as borderline, and 50 were judged to be free of the disorder. Preservice variables assess were education, attitudes toward the Vietnam war, age upon entering the service, and type of entry. Included among in-service variables were level of combat, immediacy of discharge, injuries sustained, assignment in Vietnam, and duration of military assignment. Post-service variables considered were helpfulness of family upon return, talking about Vietnam, locus of control, education after return, and socieconomic status. The results of a discriminant analysis indicated that the perceived helpfulness of the veteran's family upon his return was related significantly to post-discharge adjustment. Those with the most supportive families fared best.

Post-traumatic stress disorder subjects, on the other hand: (1) avoided discussing the war on their return; (2) reported a more immediate release than did those without the disorder; (3) experienced higher levels of combat; and (4) had a more external locus of control; that is, they felt that important events in their lives were either uncontrollable or unpredictable. Similarly, Foy, Sipprelle, Rueger, and Carroll (1984) also studied the relative contributions of premilitary and military adjustment and combat exposure to the development of PTSD among 43 combat veterans, 21 positive and 22 negative. These authors found that intensity of combat exposure and military adjustment variables (e.g., substance abuse, disciplinary actions, psychiatric contacts) correlated significantly with post-military adjustment. On the other hand, no significant relationship was found between premilitary variables, e.g., family stability, school achievement, legal problems, and post-discharge psychopathology.

Wilson and Krauss (1981) tested 114 Vietnam veterans attending Vet Centers to predict post-traumatic stress disorders. They found that the number and type of combat roles (e.g., reactive or initiative, their perceived stressfulness, and number of weeks in combat were all related significantly to the magnitude of PTSD. The stressor variable that accounted for most of the variance in PTSD symptoms was exposure to death or injury. For the homecoming variables, psychological isolation correlated significantly with all of the PTSD factors, while drug usage and seeking counseling correlated significantly with most of the factors. Finally, premorbid personality characteristics, e.g., anti-social, paranoid, narcissistic, accounted for less than 3.5% of the variance of the seven PTSD factors. The best predictor variable for each dimension of PTSD (except intrusive imagery) was psychological isolation on returning home.

Finally, Watson, Kucala, Manifold, Juba, and Vassar (1988) compared the self-reported incidences of adolescent legal problems, drinking employment,patterns, and church attendance in 116 psychiatric patients, with and without PTSD. The differences did not exceed chance expectations, and the authors argue that the results raise doubts about the validity of the claim that PTSD is at least partially a result of pre-traumatic personality maladjustment.

(c) Character pathology may function as a selector of those who choose high risk occupations for their inherent value. Boredom with civilian life and the desire to escape are cited by several Canadian veterans (MacDonald, 1989). The question of combat addiction can, however, be viewed from conditioning and biological perspectives, and will be discussed below (Sections 2.5 and 2.6).

(d) Character pathology may develop from the trauma: preexisting personality traits may become a disorder proper, or a personality disorder may arise from the trauma. This may be particularly an issue when the veteran is young and still in the process of personality development at the time of the trauma. Haley (1985) argues that the major traumas occurring at developmentally vulnerable times, often compounded by the violent death of a combat buddy, as was the case for most Vietnam veterans, have a deforming impact on psychic structures. Young (1988) contends that for those youths who experience a traumatic event, the mental processes involved in shaping concepts of self and others are broken, with impaired ability to form intimate relationships as consequence. Like Horowitz (1974) he argues for cognitive integration to derive meaning for the event. Garte (1985) hypothesized that Vietnam veterans with PTSD have not successfully accomplished the task of E. H. Erikson's (1950) 5th psychosocial stage of development, viz., identity vs. identity diffusion. PTSD subjects were administered the Career Maturity Inventory, and results showed that subject scores most closely approximated the average for children in the 7th and 8th grades who were about 15 to 20 years younger than the patients. When compared to a norm group of high school seniors, the average score of the veterans was in the 23rd percentile. The author suggests that these patients were vulnerable to the developmental shock of PTSD, due to unsuccessful passage through earlier Eriksonian stages.

In an interesting investigation of Vietnam veterans in their midlife years, Opp (1987) focussed on the nature of the interaction effects of PTSD and mid-life issues, such as work, concerns about death, decreasing confidence, mourning of parents' death, change in sex role and sexual potency, adjustment to the aspiration/achievement gap, acceptance of the demonic in the self, increase in affiliative needs, change in marriage, defining one's identity and future goals. PTSD and mid-life issues tended to intensify each other, with significant effects noted for issues involving death acceptance, need for affiliation, acceptance of the personal demonic, and personal identity.

2.4.3 Post-trauma Social Supports

Investigations of non-combat-related stress response patterns have examined coping and social supports, on the premise that such factors operate to buffer the individual from the negative effects of stress (Johnson & Sarason, 1978; Mitchell, Billings, & Moos, 1982). Billings and Moos (1985) hypothesize that the depression-related outcomes of stressful life circumstances are influenced by individuals' personal and environmental resources as well as by their appraisal and coping responses. These resources can affect the occurrence of stressors, shape the nature of the coping responses selected to deal with them, and influence the adaptive outcome of the stressful episode. Thus, the link between life stressors and depression is seen as mediated by individuals' personal and environmental resources, their cognitive appraisal and coping responses, and the interrelationships among these domains. Environmental resources can affect adaptation by optimizing personal attributes such as self-esteem, facilitating stress-reducing coping interventions and by fostering healthy function in the absence of the stressor. Supportive interpersonal ties are cited as a primary environmental resource by the authors.

Among Vietnam veterans with post-traumatic stress disorder, studies have shown that social support following exposure to trauma may be critical in determining whether a trauma survivor exhibits symptoms of the disorder (Barrett & Mizes, 1988; Center for Policy Research, 1981; Stretch, 1985). Stretch (1986) studied the incidence and etiology of PTSD among non-civilian Vietnam and Vietnam-era male veterans. Questionnaire data (measuring attitudes about the war, combat exposure, social support, physical health, and PTSD symptoms) were collected from 238 Vietnam veterans (mean age 33.9 years) stationed at a moderate-sized U.S. Army post on the east coast during the spring of 1982. Results showed a significantly lower incidence of PTSD (12.2%) than was reported in the literature among civilian Vietnam veterans (which Stretch cited as 18-54%). Social support received during the first year back from Vietnam appeared to contribute more to the attenuation of PTSD symptoms than did combat experience alone. In addition, the author found significant correlations between PTSD symptoms and self-perceived physical health.

In the first study on Canadian veterans of the Vietnam war, Stretch (1988), found a PTSD prevalence rate, currently being experienced, of about 56% among his mailed questionnaire respondents. Results indicated that those veterans who were Canadian citizens at the time of their service in Vietnam have significantly higher levels of current PTSD symptomatology than do those veterans who were U.S. citizens at the time of their service. Moreover, the problems with PTSD have not diminished over time, they have only gotten worse. Stretch hypothesizes that a likely cause to this significant development is the lack of social support from Canadian society as well as the lack of any medical or psychological readjustment counselling benefits from either the government of Canada, or, until recently, the United States. One measure of the worsening plight of these individuals might be the relatively low response rate to the research questionnaire (35%), compared to a 50% response rate among American veterans. The author states "The group I sampled are probably better off than most of the veterans living in Canada. At least they can talk about their experiences. For a lot of them it's just too painful for them to talk about it" (MacDonald, 1989, p. 34). The questionnaire, indeed, was received by veteran subjects while the present investigation was underway, and was given a deeply suspicious reception for its possible official, or government, connection. This may be consistent with the hypervigilance and mistrust symptomatically found among even non-PTSD veterans (Center for Policy Research, 1981).

2.5 Etiologies: Learning Theory

A learning theory for conceptualizing the etiology and treatment of combat-related post-traumatic stress disorder has been posited by Keane, Zimering, and Caddell (1985). Based primarily on Mowrer's (1947) two-factor learning theory, the current model emphasizes the importance of both classical conditioning and instrumental conditioning in the development of psychopathology. In the first factor of this formulation, the development of post-traumatic stress disorder symptoms is a function of (a) classical conditioning of physiological and behavioral responses and

(b) instrumental learning, whereby individuals will avoid those conditioned cues that evoke anxiety. In his pioneering work, Pavlov found that presentation of electric shock to an organism led to reflexive withdrawal of the shocked extremity, as well as an array of behavioral responses indicative of fear. When a bell was repeatedly paired with the shock, the bell alone eventually came to elicit a similar fear response. The animal learned to respond both behaviorally and physiologically to a previously neutral stimulus (bell, conditioned stimulus) when it was paired with an aversive event (shock unconditioned stimulus).

The second factor in Mowrer's theory is that an organism will attempt to escape or avoid an aversive stimulus. In Pavlov's experiments, due to the pairing of the bell (conditioned stimulus) with the shock (unconditioned stimulus), the organism is motivated to escape from the conditioned stimulus. Escaping the conditioned stimulus presumably results in a reduction of conditioned fear which reinforces this escape response. It is this escape and avoidance of the unconditioned stimulus pattern that parallels many forms of human psychopathology and that has been cited as a formulation for various anxiety mediated disorders.

In the two-factor theory of Keane et al. (1985), it is argued that different organisms acquire fear through similar mechanisms. Just as the organism in Pavlov's studies learned to respond with fear to a previously neutral conditioned stimulus, humans exposed to a life threatening experience can become conditioned to a wide assortment of stimuli present during the trauma. For example, as noted in Section 2.2, sounds, smells, terrain, time of day, the people present, and even cognitions cam become conditioned to the traumatic event. Thus, each stimulus can evoke anxiety responses similar to those experienced during the event. If a traumatized person encounters one of these stimuli at a later time, it may result in a disruptive startle response or a conditioned response, such as heightened emotionality.

Keane et al. indicate that Vietnam veterans with post-traumatic stress disorder display far more complex symptoms than a simple startle response. To explain the broad range of stimuli that can evoke anxiety in Vietnam veterans, they suggest that higher order conditioning in part can explain the wide array of anxiety-provoking stimuli. Again with the example of Pavlov's dogs, once the conditioned stimulus (the bell) comes to evoke fear on its own, it can be paired with a new neutral stimulus (e.g., a light). With repeated pairings of the light and bell, the light becomes a higher order conditioned stimulus, capable of producing fear by itself. Similarly, cues that were conditioned by combat trauma can be paired with the new stimulus that may in turn evoke anxiety. A second and related principle, stimulus generalization, proposes that the more similar a novel stimulus is to a conditioned stimulus, the stronger the response will be to that new stimulus. For example, sudden loud noises (e.g., a vehicular backfire) are often similar enough to gunfire to evoke a defensive or aggressive response in combat veterans. The authors suggest that with both higher order conditioning and stimulus generalization the way is opened for a wide range of stimuli to evoke the memory of trauma and/or its physiological components in veterans with post-traumatic stress disorder. The greater the number and variety of stimuli than can evoke an anxiety response, the more difficult it becomes for the traumatized veteran to avoid the stimuli, they argue. For instance, failure to avoid "benchmark symptoms" of PTSD like intrusive thoughts about the war, flashbacks and nightmares, thus results in repeated exposure to the symptom, including its physiological correlates, and serves to reinforce them. Learning theory models for PTSD would predict that interventions that focus on deconditioning negative arousal to cues of the traumatic conditioning experience should be therapeutically beneficial. As such, a primary goal of behavior therapy for combat-related PTSD is reduction of the veteran's dysfunctional arousal to traumatically conditioned cues (Fairbank & Nicholson, 1987; Shelton, 1985).

2.6 Etiologies: Biological

Numerous studies (e.g., Anisman, 1978) have shown that exposure to stress produces central nervous system changes biochemical alterations. Anisman's (1978) extensive review of the literature on stress-induced neurochemical changes indicates that neurotransmitter activity varies as a function of frequency, duration and intensity of the stressor; and the subject's level of control over stress onset or termination. For example, profound norepinephrine depletion has been found in animals under conditions of acute stress (Krieger, 1983; Maynert & Levi, 1964).

Van der Kolk, Greenberg, Boyd, and Krystal (1985), in an important biological model for the etiology of post-traumatic stress disorder, proposed that the neurochemical changes (i.e., adrenergic and endorphin) that occur in animals exposed to inescapable shock provide impetus for the consideration that the behavioral sequelae of PTSD in man may parallel observed responses in animals. The model borrows from experiments of animal learning, Seligman and Maier (1967), in which the authors found that dogs given inescapable electric shock in a Pavlovian hammock showed several classes of deficits 24 hours later in a shuttlebox where the simple act of crossing a barrier would terminate the shock. In contrast to dogs who had not previously experienced shock, these dogs showed: (a) motivational deficits, rarely initiating attempts to escape; (b) learning deficits, not following an occasionally successful escape response with another; and (c) emotional deficits, passively enduring the shock without overt signs of emotionality. The authors proposed that these deficits were the consequences of learning by the dogs, i.e., that responses and outcomes (viz., shocks) were independent of each other, that nothing the animals did effected the events. Seligman posited an expectation of future uncontrollability (i.e., helplessness) to be generalized to the new situation where it produced the observed deficits. the behavioral effects of inescapable shock in animals, with the so-called "learned helplessness" response.

To van der Kolk et al. (1985), such a biological model of post-traumatic stress disorder suggests that life-threatening traumatic events and associated stimuli may act as stressors capable of producing profound catecholamine depletion similar to the depletion of norepinephrine after acute inescapable shock in animals. (Cf. also the role of amygdala regulation of adrenocorticotropin hormone in response to inescapable shock, as Beaulieu, diPaolo, & Barden [1985] investigated.) Thus, some symptoms of PTSD (e.g., decreased motivation, decline in occupational functioning) are viewed as correlates of norepinephrine depletion, resulting in learned helplessness. Moreover, trauma-induced norepinephrine depletion may lead to adrenergic hypersensitivity, which would account for PTSD symptoms of hyperactivity (i.e., startle responses, explosive and impulsive behavior, nightmares, and intrusive flashbacks. (Pharmacotherapy for PTSD, however, has remained symptomatic, i.e., antidepressants for depression, anxiolytics for anxiety and neuroleptics for severe flashback symptoms [Blake, 1986; Brodsky, Doerman, Palmer, &

Slade, 1987; Burstein, 1984; Davidson, Walker, & Kilts, 1987; Falcon, Ryan, Chamberlain, & Curtis, 1985]).

Kolb (1987) combined these data with the known functional and structural defects of certain components of the central nervous system (such as peripheral auditory nerve damage subsequent to prolonged and elevated noise volume levels), to formulate a neuropsychological hypothesis to explain post-traumatic stress disorder. In it, Kolb argues that the primary result of excessive emotional stimulation may be its effect on the function and perhaps the structure of the central nervous system, particularly as it concerns control of aggressivity. Such stimulus overload occurs when the human organism's capacity to process information signaling a threat to life overwhelms the cortical defensive structural processes concerned with perceptual discrimination and effective adaptive responses for survival. He argues that actual neuronal death cannot be excluded. The neuronal synaptic structures affected are probably located in the temporal-amygdaloid complex concerned with agonistic behavior; these structures are stressed by recurrent intensive stimulation. They may recover, be temporarily impaired, or undergo permanent change, as seen in the peripheral acoustic system (Kolb, 1988, p. 993).

In terms of the clinical behavior pattern of post-traumatic stress disorder, Kolb posits that the individual veteran would regress to a stage of hypersensitivity in which a multitude of stimuli, both internal and external, lead to arousal. Recurrent intensive emotional arousal both sensitizes further and simultaneously disrupts those processes related to learning and habituation. This leads to reappearance or intensification of existing symptoms. With excessive cortical sensitization and diminished capacity for habituation of the agonistic neuronal system, lower brainstem structures, activated by the neurotransmitter norepinephrine, escape from inhibitory cortical control. Through their extensive cortical and sub-cortical connections, they, in turn, repeatedly reactivate the perceptual, cognitive, affective, and somatic symptoms related to the trauma. Thus, in the face of perceived threats, there occurs excessive sympathetic arousal with behavioral consequences like irritability, and repetitive cortical reactivation of memories related to the trauma. These may be projected as flashbacks or nightmares. The constant symptoms of PTSD, then, are explained as functions of cortical synaptic changes related to those processes which underlie sensitization, learning and habituation.

CHAPTER III

METHOD

3.1 Introduction

In this chapter, the method of investigation is presented in four sections: design of the study, assessment procedure, materials used, and hypotheses to be examined.

3.2 Design of the Study

In the present investigation, volunteer Vietnam combat veterans with and without post-traumatic stress disorder are compared with each other and with an age matched sample of normal control subjects. Summary statistics are presented for the veteran and control samples and mean differences are evaluated. A clinical analysis is also undertaken whereby for each veteran's score a percentile rank with respect to the control sample is obtained. The number of veterans scoring in the clinical range is then tabulated for each measure.

3.3 Hypotheses

Placed in the null hypothesis form, the following hypotheses are tested:

1. In terms of neuropsychological test results, there are no differences between combat veterans with post-traumatic stress disorder (PTSD+) and combat veterans without symptoms of the disorder (PTSD-), as determined by a standard measure of combat-related stress.

2. There are no differences between combined groups of combat veterans and civilian controls.

3.3.1 Supplementary Hypotheses

As outlined in Chapter 1, Section 1.5, the data are analyzed in terms of expectations of deficits consistent with DSM-III-R symptomatology, as well as the Klonoff et al. (1976) findings.

As well, data are clinically examined to determine dysfunctional profiles, if any. The number of veterans scoring above clinically significant cutoff are ascertained from the control distribution. A correlation between neuropsychological variables and individual results on the Mississippi Scale are also calculated. Finally, possible consistency with psychometric lateralization of affective disorders among PTSD victims are evaluated.

3.4 Testing Procedure

3.4.1 Test Setting.

One-half the subjects (i.e., the Canadian component, numbered 15) were assessed in the offices of a professional psychology practice in Edmonton. The American subjects were tested in an office set aside for that purpose in the Missoula, MT Vet Center. In both settings, the testing room was free of distraction, and contained the psychometric equipment and materials described below. Volunteer subjects were seated across a testing table from the examiner. Time taken to complete full testing ranged from four to six hours.

3.4.2 Examiner

The examiner in all cases was the writer, who has completed graduate training in neuropsychology, clinical psychology, and neuroanatomy, including clinical internships, and is a chartered psychologist of the Province of Alberta. Included in the training was the administration of the HRNTB in standardized fashion (Boll, 1981).

3.4.3 Data Interpretation

Following administration, scoring and computer entry of the test data, the results were interpreted by the writer. Interpretation was based on the methods developed by Reitan (1959, 1974), Jarvis and Barth (1984), and Wiens and Matarazzo (1977). These procedures include evaluation of (a) level of performance, (b) pathognomonic signs (i.e., a constellation of symptoms indicative of a particular disorder), (c) pattern of performance among the aggregate of scores, and (d) inferential diagnoses of lateralized brain function by comparison of the sets of scores from both sides of the body. Clinical examination of patterns of the results were also made, using the recently published norms of Yeudall et al., (1986) and Yeudall et al., (1987). All participants in this investigation were apprised of their results in clinical debriefing sessions with the writer.

3.5 Materials

Materials used for this investigation were the Halstead-Reitan Neuropsychological Test Battery (HRNTB), and allied tests, including the Wechsler Adult Intelligence Scale - Revised (WAIS-R) and the Mississippi Scale for Combat-Related PTSD (Keane, 1988). The scoring metrics for the neuropsychological data are presented in Table 3.2. The Mississippi Scale was provided by the Missoula, MT, Vet Center, and the HRNTB and WAIS-R were provided by the Testing Center, Clinical Services, Department of Educational Psychology, University of Alberta.

3.5.1 Description of Tests in the Halstead-Reitan Neuropsychological Test Battery (HRNTB)

Twenty-seven behavioral measures were originally employed by Halstead (1947) in his study on brain lesions.

Table 3.1

Scoring Metrics for Neuropsychological Variables

Variable	Unit of Scoring
Speech Sounds Perception Test	Total errors
Trail-Making Tests	Time in seconds
Halstead Category Test	Total number of errors
Finger Tapping Test	Mean number of taps per five trials
Dynamometer	Mean kilograms per two trials
Seashore Rhythm Test	Total number of errors
Tactual Performance Test	Time in minutes
Tactual Performance Test Location Score	Number correct
Tactual Performance Test	Number correct
Memory Score	Number correct

Of these, ten were used by Reitan (1955) to form the core of what is now known as the HRNTB: Category Test, Tactual Performance Test (Time, Memory, and Localization components), Seashore Rhythm test, Speech-Sounds Perception test, and the Finger Oscillation test. Allied procedures added by Reitan were the Trail Making Test, Parts A and B, Strength of Grip Test (Hand Dynamometer), Sensory-Perceptual Examination: Tactile, auditory and visual, Aphasia Screening Test, and the Wechsler Adult Intelligence Scale. In typical clinical procedures, many examiners add to, or subtract from the HRNTB tests of their own choice, in order to address specific referring questions, such as those dealing with psychiatric or school performance issues. What follows are brief descriptions of the HRNTB tests, as well as their standardized, clinical applications.

3.5.1.1 Category Test

The subject is presented with 208 stimulus figures, subdivided into seven subtests. In the standard edition of the test, the figures are presented sequentially on a 10" by 10" back-lit projection screen. In the edition employed in this set of examinations, the "Booklet Category Test," the figures were presented on 8.5" by 11" cards, bound in ring binders. In each of the seven subtests, the subject is asked to determine the principle or concept underlying the series of presented figures. Roman numerals, for instance, is the concept employed in the first, and simplest, subtest.

In following subtests, though the concept always remains the same, it frequently shifts in its manifestations, i.e., different figures illustrating the same idea. Subtests become increasingly complex as the test progresses, from roman numerals to simple quantification (e.g., two items appearing, with the correct answers as "two"), advancing to identifying "odd man out" items in a series of figures. The middle of the test has subtests involving the use of quadrants and proportions. The final subtest requires the subject to recall previous responses by presenting stimulus figures previously seen. The subject is instructed to respond to each figure with a number response between one and four, and these numbers, in Arabic numerals, are placed on a strip of paper, left to right, before the subject. The examiner then informs the subject as to the correct or incorrect nature of his response. No further clues are given, and only one attempt per figure is permitted. On the basis of the examiner's responses, the subject is expected to formulate a successful hypothesis, testing different theories on consecutive attempts, until he induces the correct concept. Progression from one subtest to the next is announced by the examiner, and accompanied by a caveat that the concept in the next subtest "may be the same, or it may be different" from the previous subtest.

The Category test is a concept formation test, requiring the subject to discriminate visually the similarities and differences between presented figures;

formulate hypotheses about the figures; validate his hypotheses on the basis of the pattern of examiner affirmations and negations; and shift hypotheses accordingly until a correct one is obtained (Shaw, 1966). The lack of opportunity for verbalization, the bare minimum of reinforcements, and the requirement of creating a learning set with only the presented figures, can make the Category test a particularly daunting and frustrating test of abstraction. The test requires the subject to reason in an artificially independent circumstance, and persons reduced in their conceptualizing skills by cerebral impairments or psychiatric disturbance typically give evidence of their weakened abilities.

3.5.1.2 Tactual Performance Test

The Tactual Performance Test (TPT) uses a modification of the Sequin-Goddard formboard (Reitan & Davison, 1974, p. 368). With the subject wearing an opaque Scuba-type mask (or other form of blindfold) throughout the procedure, a formboard bearing ten removable, different-shaped wooden blocks is mounted at about 70 degrees from the horizontal on a table before the subject. The blocks are placed on the table between the empty board and the subject, and he is instructed, first with the use of only his dominant hand, then the non-dominant, and finally with both hands, to place each block in its own receptacle on the board. Time taken to complete each trial is recorded, allowing comparisons to be made between the hands, as well as the overall total.

With all three trials complete, and before the subject may view the board and its blocks, the apparatus is removed from sight, the mask is taken off, and the subject is asked to draw the shapes, relative to one another on the board, as he imagined them to be placed. A Memory score is derived from the number of blocks correctly reproduced and a Localization score is derived from the number of blocks correctly located with relation to one another.

The complexity of the TPT lies in the multifaceted requirements for "tactile discrimination, kinesthesis, coordination of movement of the upper extremities, manual dexterity, and an understanding of the relationship between the spatial configuration of the shapes and their location on the board" (Reitan & Wolfson, 1985, p. 20). Denied the critical faculty of sight, adaptive capabilities for most persons will reasonably be taxed, but for brain-damaged or psychiatrically impaired persons, such a loss typically compromises performance significantly. On average, for instance, brain-damaged subjects require about twice as much time to complete the three trials as control subjects (Reitan & Wolfson, 1985, p. 20).

Neurologically, the processes occurring within the subject's central nervous system are hypothesized as follows: While using the dominant hand during the first trial (usually the right hand), sensations of discriminating touch, pressure and proprioception ascend through the collective dorsal columns, decussating (crossing over) at the lower medulla oblongata to terminate at the contralateral somasthetic cortex on the subject's left cerebral hemisphere, specifically the parietal cortex (Cookson & Singh, 1985, p. 11). The information thus placed is subsequently transferred, via intracerebral connections at the anterior and posterior commissures, and most importantly through the massive corpus callosum spanning the midline between the hemispheres, to the contralateral parietal cortex, i.e., ipsilateral with the probing hand. The process is repeated during the second trial, using the non-dominant (usually, left) hand, and decussating in reverse order, again to terminate at the contralateral somasthetic cortex. Thus, bilateral transfer of information is effected to both hemispheres through these neural pathways.

Information transfer within this system is theoretically impaired by the presence of a lesion, and time elapse comparison of dominant and non-dominant, as well as overall time elapse, when compared with those of healthy age mates, can help to determine the state of integrity of the pathways and the cortical areas they serve. For instance, for most persons, consistent with expectations for non-dominant practice effect (where learning during the first trial, as outlined above, might presuppose faster times on the second trial), it was found by several norming studies (Reitan & Wolfson, 1985, p. 22) that the second trial usually requires about two-thirds of the time taken during the first trial, and that the third trial (using both hands) usually requires about two-thirds of the time of the second trial.

The TPT has shown a fairly consistent dysfunctional pattern among alcoholics (Lezak, 1983, p. 461). Right-hand dominant male alcoholics tend to show slower results for both hands (with greater slowing in the left), and with near normal Memory, but markedly lowered Location scores.

3.5.1.3 Finger Oscillation Test

In this easily quantifiable test of fine motor speed and dexterity (Gill, Reddon, Stefanyk, & Hans, 1986) the subject is asked to depress a lever connected to a counter as rapidly as he can for five bursts of 10 seconds each. Hand and upper arm positions are standardized, i.e., as flush with the table surface. Comparisons between the two sets of measures are expected to show the dominant hand to exceed the non-dominant hand by about 10%. Similar to the TPT, neural pathways involving the dorsal columns are employed. The test purports to assess the integrity of these pathways, as well as the contralateral motor strip of each hand.

3.5.1.4 Strength of Grip Test (Hand Dynamometer)

A spring-loaded plunger type dynamometer measures both dominant and non-dominant hand strengths. Another left-right comparison, the subject's dominant hand is expected to be about 10% stronger than his non-dominant hand. Reitan (1985) views this measure as complementary to the finger oscillation test, in that the latter tests for speed, and the former, for strength. Represented in the motor strip of the precentral gyrus of the posterior frontal lobes, motor functioning is relatively easy to establish by these tests (Reddon, Stefanyk, Gill, & Renney, 1985; Swiercinsky, 1978).

3.5.1.5 Trail-making Test, Parts A and B (TMT A & TMT B)

In TMT A, the subject must connect in order, as rapidly as possible, a series of circled numbers randomly scattered over a sheet of 8 1/2" by 11" paper. In TMT B the requirement is to join circles of numbers and letters, in consecutive and alternative manner. The tests require speed, visual scanning, and the ability to progress in sequence. TMT B additionally requires that numerical and alphabetical symbols be integrated and alternated. Defective time in TMT B, relative to TMT A, is deemed to indicate difficulty with complex tracking tasks. However, single datum interpretation is always unreliable. For example, while brain damage may be present, poor motivation, conceptual confusion or simply motor incoordination must be ruled out before such a diagnosis can follow. Motor speed and attention functions are assessed, and the test is rated as highly sensitive to the presence of brain dysfunction (Lezak, 1983, p. 556). As a visuomotor speeded test, the TMT is sensitive to normal ageing, and age-appropriate norms must be consulted for scoring purposes (Bornstein, 1985).

3.5.1.6 Reitan-Indiana Aphasia Screening Test

Designed to identify failures of performance and specific deficits (called "pathognomic signs" by Reitan, 1985, p. v), the Reitan-Indiana Aphasia Screening Test provides fairly simple tasks: Naming common objects; spelling simple words; identifying individual numbers and letters; reading, writing, enunciating and understanding spoken language; identifying body parts; calculating simple arithmetic problems; differentiating between right and left; and copying simple geometric shapes. The test gives indications of brain-related deficiencies or abnormalities in terms of particular sensory modalities of perception and expression. Test interpretation is reliant on examiner skill, and there are no scores for normative comparisons.

3.5.1.7 Reitan-Klove Sensory Perceptual Examination.

These procedures are similar to clinical neurological examinations. The subject is initially required to perceive unilaterally presented stimulation on each side of the body, after which the stimuli are presented bilaterally and simultaneously. The object is to determine whether the subject perceives unilaterally only or whether bilateral simultaneous stimulation results in neglecting or suppressing one or the other stimuli. Subjects with lateralized cerebral lesions are often able to identify unilateral stimulation correctly but sometimes are unable to respond to bilateral simultaneous stimulation. The neurological model being investigated with such tests is relatively simple: even a damaged hemisphere can adequately subserve perception of a simple stimulus when there is no functional involvement of other brain areas. If, therefore, the left hand is touched, the stimulus is perceived by the right cerebral hemisphere; perception can occur even if the right cerebral hemisphere is damaged. However, when the left cerebral hemisphere is required to perform exactly the same task simultaneously, the damaged right cerebral hemisphere sometimes is no longer able to perceive the stimulus. A damaged hemisphere is not able to perform its function as well when the homologous area of the other cerebral hemisphere is processing information at the same time (Reitan, 1985, p. 33).

3.5.1.7.1 Tactile

All tests of tactile sensitivity are performed without aid of sight. The subject's hands are touched separately, first, to determine threshold sensitivity. The subject is asked to identify which hand is receiving stimulation. In a pre-ordained, random, manner, the subject is then touched both unilaterally and bilaterally. Contralateral face-hand patterns of tactile stimulations are also included. The subject is not advised as to examiner intentions to stimulate bilaterally.

In an allied procedure, the subject is asked to identify the individual fingers on each of his hands. Parietal lobe lesions, contralateral to the stimulated fingers, typically result in imperceptions.

In a final test of tactile sensitivity, the subject is asked to report which number--three, four, five or six--written randomly in a standard pattern, he feels on the finger tips of each hand. This test requires greater concentration than the other tactile tests (Reitan, 1985, p. 35), and frequency of errors is negatively correlated with I.Q. Primary information is, again, related to lateralized performance differences, and integrity of function of the contralateral post-central gyrus of the parietal lobe and associated pathways are typically inferred from the results.

3.5.1.7.2 Visual

The examiner, seated directly in front of the seated subject, executes discrete movements with his fingers at arm's length (in three settings: at eye level, above and below), while the subject fixes his gaze straight ahead. Unilateral movements are randomly interspersed with bilateral ones. The subject is asked to identify which hand is being moved.

3.5.1.7.3 Auditory

The examiner, standing directly behind the subject, rubs thumb and index finger together, close to the subject's ear(s). The subject is again asked to identify which ear(s) is being stimulated.

3.5.1.8 Seashore Rhythm Test

In this audio taped subtest of the Seashore Tests of Musical Talent (Lezak, 1983, p. 374), sixty groups of rhythm sounds are presented in pairs, and the subject is asked to distinguish their similarity or difference. In addition to perceiving and comparing different rhythmic sequences, the test requires sustained attention and concentration, and alertness to non-verbal auditory tasks. Lezak (1983, p. 374) states that "patients with right temporal brain damage tend to do poorly" on the Rhythm Test, though Reitan and Wolfson (1985, p. 23) state that the test has no lateralization significance, but appears to be a significant indicator of the integrity of overall cerebral functioning. Aging appears to have no significant effect on the capacity measured by the test. Good scores on the test, given other evidence of brain damage, is often held to indicate stabilized, as opposed to progressive, brain damage.

The investigation of acoustic-sequential functions are based on non-verbal properties of auditory input. Luria (1966) indicated that sequential information is mediated in the temporal and frontotemporal regions of the cortex. He proposed that the temporal lobes are involved in the analysis and synthesis of acoustic information. While both temporal lobes appear to be involved in acoustic analysis of pitch, the right hemisphere appears to play a greater role.

3.5.1.9 Speech-Sounds Perception Test (SSPT)

The SSPT has been in use in neuropsychological testing for over 49 years as an indicator of cerebral abnormal functioning, specifically phonological ability (Reddon, Schopflocher, Gill, & Stefanyk, 1989). During the SSPT, the subject hears spoken words from an audio tape. Most of these words are non-sense, and all are variants around the "ee" diphthong (e.g. theeks, feet, leeng). For each of the sixty items on the test, the subject is asked to underline one of four alternative words on a printed form. In addition to tapping the subject's sustained attention throughout a relatively complex and rapid task, the test requires auditory-verbal perception, and auditory-visual coordination of language processing. Sensitive to brain damage generally, the test is particularly sensitive to left hemispheric damage (Lezak, 1983, p. 372).

3.5.1.10 Wechsler Adult Intelligence Scale-Revised (WAIS-R)

These well-known scales, probably the most widely used tests for evaluating general intelligence, have been developed over the past forty years, and have generated an immense body of research. They are described by Wechsler (1981), Matarazzo (1972), and Lezak (1983). More recent research has indicated their usefulness in determining lateralization, localization, acuity versus chronicity and diffuse versus focal qualities of cerebral lesions (Matarazzo, 1972, pp. 377-399; Reitan & Davison, 1974, pp. 227-235). Wechsler's scales are subsumed by the HRNTB for their ability to give standardized, statistically comparable data on the following basic intellectual functions of an individual: (a) receptive functions, which involve the abilities to acquire, process, classify, and integrate information; (b) memory and learning, by means of which information is stored and recalled; (c) thinking, which concerns the mental organization and reorganization of information, and (d) expressive functions, through which information is communicated or acted upon (Lezak, 1983, p. 20). Language skills, abstract reasoning, old versus new learning ability, immediate and long-term memory, perceptual and motor abilities, understanding and following instructions, and capacity for attention are among the functions that are tapped.

Wechsler scales are divided into verbal ("Verbal") and non-verbal ("Performance") scales composed of subtests for observing different capabilities. Verbal subtests include Information, Comprehension, Digit Span, Arithmetic, Similarities and Vocabulary. The Performance scale includes Picture Completion, Picture Arrangement, Block Design, Object Assembly and Digit Symbol. Individual subtest scaled scores, Verbal Intelligence Quotient (I.Q.), Performance I.Q. and Full Scale I.Q. are calculated. While such composite scores remain valid predictors of academic achievement, some authorities dispute their validity as neuropsychological measures. Lezak, for instance (1983, p. 22), argues that composite scores represent so many different kinds of functions that they become "meaningless" in determining a neuropsychological disorder. Both Verbal and Performance scores, specifically, are based on averages of some quite dissimilar functions (Parsons, Vega & Burn, 1969). Greater interpretive reliance has therefore been placed on individual subtest scores in this study.

CHAPTER IV

RESULTS

4.1 Introduction

The findings from the present investigation are presented in this chapter. A discussion of subjects and methods of data screening are reviewed prior to analysis, followed by summary statistics for all groups, and the results of the evaluation of mean differences. An overall clinical interpretation of the data concludes the analysis.

4.2 Subjects

Three groups of subjects comprised the samples under investigation: Vietnam combat veterans residing in Alberta; Vietnam veterans residing in Western Montana; and a normal control group obtained from the research of Yeudall et al., (1987) and Yeudall et al., (1986). No veterans were in-patients nor consuming any prescription medications. None had been hospitalized for psychiatric reasons within the past five years. Although some veterans had abused alcohol and marijuana, none had pursued such activity for at least two previous years. At the time of this investigation, all subjects were engaged in steady employment, with one veteran on a PTSD-related leave of absence, and another on a medical pension (in the process of applying for PTSD-related benefits). All participants were either married, living in a stable relationship, or declared themselves to be satisfied in their single living arrangements. All veteran subjects were approached in person, and invited to participate in the study; there was no remuneration provided, though test results were debriefed with every subject.

4.2.1 Canadian subjects.

Canadian subjects were members of the Canadian Vietnam Veterans Association in Edmonton. The group was approached for purposes of this investigation by the writer. Fifty-three per cent (8 of 15) were native or naturalized Canadians on induction. At the time of this investigation, all subjects, including native American veterans, had been residing in Canada for over ten years, and were either naturalized citizens or landed immigrants. The group was unselected in terms of PTSD. The subject group was composed of members of all branches of the U.S. Armed Forces, and served in a combat capacity in all operations zones (Corps I, south of the demilitarized zone, II, III, and IV, surrounding the Mekong Delta) in South Vietnam between 1964 and 1975. Demographic variables of subjects is summarized in Table 4.1. At the time of this investigation, all subjects were either married, living within a stable common-law relationship, or preferentially single.

4.2.2 American subjects.

The American subjects all resided in the Western Montana region, though only two were native Montanans. All were native Americans during their service. All were participating, or had recently completed participating in, some form of counselling at the Missoula, MT "Vet Center", an outreach readjustment counselling center funded, but not operated, by the U.S. Veterans Administration. Their participation in the study was also without remuneration. And, like their Canadian counterparts, all participants were engaged in full-time employment and either married, living within a common-law relationship or preferentially single.

Table 4.1

Demographic Characteristics of Subject Groups

	Group 1	Group 2	Group 3
Sample Size	7	23	40
Mean Age(S.D.)	39.71(2.81)	42.30(4.16)	40.92(5.56)
Range	36 - 44	34 - 53	34 - 53
Median Age years	41.00	41.50	40.00
Mean WAIS-R			
VIQ	111.0(14.50)	113.26(14.50)	
PIQ	106.6(9.70)	106.46(11.20)	
FSIQ	109.9(13.60)	111.00(12.94)	

Group 1: PTSD Positive veterans
Group 2: PTSD Negative veterans
Group 3: Controls

4.2.3 Normal Control Group

Control data are a sub-sample of the controls reported by Yeudall et al., (1986) and Yeudall et al., (1987), consisting of 40 male volunteer subjects with no reported history of psychiatric or neurological illness. Subjects were screened for absence of the following criteria:

significant bleeding, toxicity or other complications during their mother's pregnancy, birth complications, low birth weight, febrile convulsions, encephalitis or epilepsy, meningitis, closed head injuries associated with postconcussional sequelae, neurological disorders of the central nervous system, psychiatric illness or an alcoholic history (Fromm-Auch & Yeudall, 1983; Yeudall, Fromm, Reddon, & Stefanyk, 1986; Yeudall, Reddon, Gill, & Stefanyk, 1987).

4.3 Data Screening Procedures

Three groups of subjects were investigated: (a) Vietnam veterans with PTSD, as determined by their score on the Mississippi Scale for combat-related PTSD (Keane, Caddell, & Taylor, 1987); (b) Vietnam veterans without PTSD, as similarly determined, and (c) civilian controls.

A listing of all tests by groups was prepared and examined for missing data. Fifteen tests plus aphasia and sensory perception screens were selected (i.e., the Halstead-Reitan Neuropsychological Test Battery). Raw scores for the HRNTB tests were generated at Alberta Hospital, Edmonton, and was matched for gender (male) and age range (34-53). As mentioned, the control data are described in Yeudall et al., (1986) and Yeudall et al., (1987). At the time of being gathered, and before being included, all data was examined visually for unusual or extreme scores, and test data checked for accuracy. Clerical, computational or entry errors were corrected.

A Multivariate Analysis of Variance, typically preceding further analyses, such as multiple analyses of variance or t-tests of means (to control for Type I error), was not performed in this study, due to the unavailability of the control data in raw form (i.e., only descriptive statistics and frequency distributions were available).

An initial comparison between American and Canadian samples, using t-tests of means (with df = 28) for all neuropsychological variables revealed significant differences on the following three paired results: HCAT (errors: Canadian Mean = 33.933, U.S. Mean = 23.067, t = 2.41, p <.023); FTAPND (taps per ten second trials: Canadian Mean = 43.400, U.S. Mean = 49.733, t = 2.40, p <.023); TMTA (time in seconds: Canadian Mean = 27.200, U.S. Mean = 31.933, t = 2.16, p <.039). By chance, one would expect 1.25 tests to be significantly different at the .05 level. However, none of the three signficant results were significant when below .002 (Bonferri adjustment = .05/25 = .002). Consequently, the two groups of data were considered to be equivalent and the data were therefore pooled.

4.4 Summary Statistics

The sample in the present investigation consisted of 70 subjects, with a mean age of 41.23 years and a Standard Deviation of 4.76. Of these, 40 were controls. Of the 30 subjects tested by the examiner on the Mississippi Scale of Combat-Related Stress, 7 were PTSD positive, and 23 were PTSD negative, with a defined cutoff score of 107 (Keane et al., 1988). This proportion, about 23%, compares with Snow, Stellman, Stellman, and Sommer (1988), who found that the post-traumatic stress disorder rate among combat veterans ranged from 1.8% to 15% of the total sample, depending on whether "exposure" to combat in Vietnam was defined relatively narrowly or broadly.

Assignment to the PTSD positive or negative group (i.e., identification of the disorder) was determined on the basis of the cutoff score (107) on the Mississippi Scale for Combat-Related Stress Disorder (Keane, et al., 1987). With a cutoff score of 107, the sensitivity of the scale (true positive/true positives + false negative times 100) was found by the authors to be 93%, i.e., 93% of patients with PTSD were correctly identified by the test. Specificity of the Mississippi Scale (true negatives/false positives + true negatives times 100) was 89%, i.e., 89% of the patients without PTSD were correctly identified. Group means and standard deviations were as follows: PTSD positive--122.000 (Standard deviation = 11.830); PTSD negative--79.217 (Standard deviation = 17.309).

Using a t-test to compare the means of PTSD-positive with PTSD-negative subjects, a significant difference resulted, i.e., t = 7.445, p <.000. The seven PTSD positive subjects may thus be said significantly to have endorsed PTSD symptomatology, and the PTSD negative sample not to have done so. Item content of the Mississippi Scale is reproduced in Appendix II.

Abbreviations used in the tables of neuropsychological variables are presented in Table 4.2. Tables 4.3 to 4.6 give summary statistics for each of the four groups by variables. Results of aphasia and sensory-perception screens are presented in Table 4.7.

4.5 Tests of Means

Tests of means for HRNTB and Wechsler Adult Intelligence Scale - Revised data were conducted on two group combinations, presented in Table 4.8: (a) PTSD positive subjects with PTSD negative subjects (Comparison 1); and (b) Combined veteran subjects with controls (Comparison 2). The number of veterans (N=30) scoring above the 90th, 95th, and 100th percentiles of control (N=40) distribution for each test variable was calculated and tabulated in Table 4.9.

Pearson Correlation Coefficients for all neuropsychological variables and the Mississippi Scale for Combat-Related Stress were calculated and presented in Table 4.10.

Table 4.2

Abbreviations for Neuropsychological Variables

Abbreviation	Variable Name
SSPT	Speech Sounds Perception Test
TMTA	Trail Making Test, Part A
TMTB	Trail Making Test, Part B
HCAT	Halstead Category Test
FTAPD	Finger Tap Test, Dominant Hand
FTAPND	Finger Tap Test, Non-dominant Hand
DYND	Dynamometer, Dominant Hand
DYNND	Dynamometer, Non-dominant Hand
TPTD	Tactual Performance Test, Dominant Hand
TPTND	Tactual Performance Test, Non-dominant Hand
TPTB	Tactual Performance Test, Both Hands
TPTL	Tactual Performance Test, Location
TPTM	Tactual Performance Test, Memory
SRT	Seashore Rhythm Test
INFO	WAIS-R Information
COMP	WAIS-R Comprehension
ARIT	WAIS-R Arithmetic
SIMI	WAIS-R Similarities
DSPA	WAIS-R Digit Span
VOCA	WAIS-R Vocabulary
DSYM	WAIS-R Digit Symbol

Table 4.2
(cont'd)

Abbreviations for Neuropsychological Variables

Abbreviation	Variable Name
PCOM	WAIS-R Picture Completion
BDES	WAIS-R Block Design
PARR	WAIS-R Picture Arrangement
OASS	WAIS-R Object Assembly

Table 4.3

Summary Statistics for PTSD Positive Subjects

(n=7)

Variable	Mean	SD	Median	Range
SSPT	6.714	3.093	6.000	4.00- 12.00
TMTA	30.714	10.688	35.000	13.00- 45.00
TMTB	70.571	21.640	68.000	47.00-108.00
HCAT	28.000	17.000	34.000	8.00- 53.00
FTAPD	53.142	10.884	52.000	38.00- 68.00
FTAPND	48.571	9.484	44.000	40.00- 65.00
DYND	47.916	7.902	49.750	33.00- 56.00
DYNND	44.580	10.532	44.750	29.50- 62.00
TPTD	4.843	1.572	5.000	1.80- 6.70
TPTND	3.814	1.511	3.000	2.20- 5.50
TPTB	2.383	0.793	2.600	1.70- 5.90
TPTL	4.000	1.732	3.000	2.00- 7.00
TPTM	6.847	1.464	6.000	5.00- 9.00
SRT	4.285	1.799	4.000	1.00- 7.00

Table 4.3
(cont'd)

Summary Statistics for PTSD Positive Subjects

Variable	Mean	SD	Median	Range
FSIQ	106.428	9.378	105.000	87.00-137.00
VIQ	108.142	11.553	114.000	93.00-123.00
PIQ	106.714	11.026	109.000	88.00-113.00
INFO	11.571	2.225	13.000	8.00- 14.00
COMP	12.285	2.214	13.000	10.00- 15.00
ARIT	10.714	3.352	11.000	7.00- 14.00
SIMI	11.000	1.857	10.000	9.00- 14.00
DSPA	8.857	1.676	9.000	6.00- 11.00
VOCA	11.286	2.058	11.000	9.00- 14.00
DSYM	10.142	1.952	10.000	7.00- 13.00
PCOM	10.714	2.430	11.000	7.00- 14.00
BDES	9.714	1.496	10.000	7.00- 11.00
PARR	9.143	1.864	10.000	6.00- 11.00
OASS	10.142	0.899	10.000	9.00- 11.00

Table 4.3
(cont'd)

Summary Statistics for PTSD Positive Subjects

Variable	Mean	SD	Median	Range
FSIQ	106.428	9.378	105.000	87.00-137.00
VIQ	108.142	11.553	114.000	93.00-123.00
PIQ	106.714	11.026	109.000	88.00-113.00
INFO	11.571	2.225	13.000	8.00- 14.00
COMP	12.285	2.214	13.000	10.00- 15.00
ARIT	10.714	3.352	11.000	7.00- 14.00
SIMI	11.000	1.857	10.000	9.00- 14.00
DSPA	8.857	1.676	9.000	6.00- 11.00
VOCA	11.286	2.058	11.000	9.00- 14.00
DSYM	10.142	1.952	10.000	7.00- 13.00
PCOM	10.714	2.430	11.000	7.00- 14.00
BDES	9.714	1.496	10.000	7.00- 11.00
PARR	9.143	1.864	10.000	6.00- 11.00
OASS	10.142	0.899	10.000	9.00- 11.00

Table 4.4
(cont'd)

Summary Statistics for PTSD Negative Subjects

Variable	Mean	SD	Median	Range
FSIQ	111.610	14.028	111.000	87.00-137.00
VIQ	113.782	14.927	114.000	87.00-134.00
PIQ	106.565	11.134	107.000	86.00-135.00
INFO	12.000	2.796	12.000	6.00- 16.00
COMP	13.913	2.334	14.000	10.00- 19.00
ARIT	10.739	3.018	9.000	7.00- 17.00
SIMI	12.435	3.042	11.500	7.00- 16.00
DSPA	9.087	1.905	9.000	4.00- 12.00
VOCA	12.956	2.976	12.000	8.00- 19.00
DSYM	9.956	5.013	7.000	6.00- 13.00
PCOM	11.260	2.072	11.000	8.00- 17.00
BDES	11.043	3.586	9.000	4.00- 14.00
PAR	10.782	2.662	11.000	6.00- 17.00
OASS	9.913	2.609	10.000	5.00- 15.00

Table 4.5

Summary Statistics for Combined Subjects

(n=30)

Variable	Mean	SD	Median	Range
SSPT	6.833	2.890	6.000	2.00- 14.00
TMTA	29.567	6.366	28.500	13.00- 45.00
TMTB	70.600	18.491	67.000	47.00-125.00
HCAT	28.500	13.351	32.000	5.00- 53.00
FTAPD	52.633	8.434	53.000	38.00- 71.00
FTAPND	46.567	7.789	44.000	34.00- 66.00
DYND	48.466	6.426	45.500	32.50- 64.50
DYNND	45.588	8.245	42.000	29.50- 62.00
TPTD	5.183	1.629	4.950	1.80- 9.20
TPTND	4.273	1.905	3.800	2.10- 9.10
TPTB	3.456	1.479	34.500	1.20- 6.40
TPTL	4.367	2.312	5.000	0.00- 8.00
TPTM	6.833	1.877	7.000	3.00- 10.00
SRT	3.233	2.417	2.500	0.00- 11.00

Table 4.5
(cont'd)

Summary Statistics for Combined Subjects

Variable	Mean	SD	Median	Range
FSIQ	110.000	13.132	111.000	87.00-137.00
VIQ	112.133	14.299	114.000	87.00-134.00
PIQ	106.137	10.478	107.000	86.00-135.00
INFO	11.900	2.644	12.000	6.00- 16.00
COMP	13.533	2.374	14.000	10.00- 19.00
ARIT	10.733	3.039	9.500	7.00- 17.00
SIMI	12.100	2.845	12.500	7.00- 16.00
DSPA	9.033	1.829	9.000	4.00- 12.00
VOCA	12.567	2.849	12.000	8.00- 19.00
DSYM	8.667	2.233	8.000	6.00- 14.00
PCOM	11.133	2.129	11.000	7.00- 17.00
BDES	9.800	2.235	10.000	4.00- 14.00
PARR	10.400	2.568	10.500	6.00- 17.00
OASS	9.967	2.312	10.000	5.00- 15.00

Table 4.6

Summary Statistics for Sample Controls

(n=40)

Variable	Mean	SD	Median	Range
SSPT	3.600	1.780	3.000	00 - 8.00
TMTA	25.700	8.234	23.250	13.30- 52.70
TMTB	63.320	19.666	60.200	34.80-111.00
HCAT	45.075	20.151	43.500	10.00-109.00
FTAPD	53.995	8.423	54.000	35.80- 70.00
FTAPND	50.605	6.463	50.700	36.60- 63.40
DYND	56.538	10.178	56.375	30.50- 83.00
DYNND	53.038	8.924	54.750	32.00- 72.00
TPTD	5.094	1.954	4.700	2.25- 11.15
TPTND	3.914	1.734	3.541	1.83- 9.43
TPTB	2.374	0.985	2.208	1.05- 5.55
TPTL	4.525	2.407	5.000	1.00- 9.00
TPTM	8.025	1.097	8.000	6.00- 10.00
SRT	3.150	2.413	3.000	0.00- 10.00

Table 4.7

Results of Aphasia and Sensory-Perception Screens

Aphasia Tests	**1**	**2**
Anomia	N	N
Verbal Apraxia	N	N
Dysgraphia	N	N
Dysarthria	N	N
Dyslexia	N	N
Auditory Agnosia	N	N
Dyspraxia	N	N
Dyscalculia	N	N
Left-right orientation	N	N

Sensory-Perception Tests		**1**	**2**
Tactile:	unilateral	N	N
	bilateral	N	N
Auditory:	unilateral	N	N
	bilateral	N	N
Visual:	unilateral	N	N
	bilateral	N	N
Finger agnosia		N	N
Graphesthesia		N	N

1 = PTSD positives
2 = PTSD negatives
N = no symptoms

Table 4.8

Tests of Means for Neuropsychological Variables

	Comparison 1		Comparison 2	
Variable	t-Value	p	t-Value	p
SSPT	0.087	0.931	**-2.637***	0.010
TMTA	0.298	0.768	1.278	0.391
TMTB	0.003	0.997	0.081	0.961
HCAT	0.069	0.945	+2.177	0.044
FTAPD	0.115	0.909	0.282	0.865
FTAPND	0.511	0.695	0.946	0.549
DYND	0.206	0.838	**-2.239***	0.035
DYNND	0.069	0.945	1.842	0.122
TPTD	0.427	0.701	0.147	0.930
TPTND	0.600	0.512	0.258	0.877
TPTB	1.915	0.248	1.290	0.385
TPT	0.400	0.699	0.297	0.858
TPTM	0.012	0.990	1.774	0.155
SRT	1.116	0.276	0.477	0.772

Comparison 1 = PTSD Positive sample N=7
PTSD Negative sample N=23
Df = 28
alpha = .05

Comparison 2 = Combined veteran samples N=30
Controls N=40
Df = 68
alpha = .05

* = Significant impairment
p = 2-Tail

Table 4.8
(cont'd)

Tests of Means for Neuropsychological Variables

	Comparison 1		Comparison 2	
Variable	t-Value	p	z-Value	p
FSIQ	0.245	0.404	**3.651**	.000
VIQ	0.971	0.194	**4.430**	.000
PIQ	0.023	0.491	**2.241**	.025
INFO	0.410	0.342	**3.469**	.001
COMP	1.738	0.044	**6.450**	.000
ARIT	0.012	0.495	1.338	.181
SIMI	1.630	0.059	**3.834**	.000
DSPA	0.148	0.442	1.765	.077
VOCA	1.687	0.052	**4.687**	.000
DSYM	0.113	0.455	**2.434**	.015
PCOM	0.106	0.450	2.069	.039
BDES	1.513	0.074	0.365	.715
PARR	2.038	0.026	0.730	.465
OASS	0.557	0.300	0.060	.952

Comparison 1 = PTSD positive sample N=7
PTSD negative sample N=23
Df = 28
alpha = .05

Comparison 2 = Combined veteran samples N=30
Age Norms*

p = 2-tail

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*From WAIS-R Tables (Wechsler, 1981)

Table 4.9

Number of Veterans (N=30) Scoring Above 90th, 95th, and 100th Percentiles of Control (N=40) Distribution

(n=30)

Variable	>90th	>95th	>100th
SSPT	19	13	0
TMTA	2	1	0
TMTB	4	4	0
HCAT	0	0	0
FTAPD	2	0	0
FTAPND	8	7	0
DYND	9	6	0
DYNND	7	6	0
TPTD	5	0	0
TPTND	4	2	0
TPTB	15	8	0.
TPTL	2	2	0
TPTM	13	13	0
SRT	3	2	0
TOTALS	93 (22.14%)*	66 (15.71%)*	

* Proportion of variable scores above significance

Table 4.9
(cont'd)

Number of Veterans (N=30) Scoring Above 90th, 95th, and 100th Percentiles of WAIS-R Norms Distribution

(n=30)

Variable	>90th	>95th	>100th
FSIQ	0	0	0
VIQ	0	0	0
PIQ	0	0	0
INFO	1	0	0
COMP	0	0	0
ARIT	0	0	0
SIM	0	0	0
DSPA	2	1	0
VOCA	0	0	0
DSYM	4	0	0
PCOM	0	0	0
BDES	2	1	0
PARR	3	0	0
OASS	2	1	0
TOTALS	13 (3.09%)*	3 (0.7%)*	

* Proportion of variable scores above significance

Table 4.10

Pearson Correlation Coefficients (R) for Neuropsychological Variables and the Mississippi Scale for Combat-Related Stress

Variable	R	p
SSPT	.0108	.477
TMTA	.1518	.212
TMTB	.1228	.259
HCAT	.1332	.241
FTAPD	-.0482	.400
FTAPND	-.1123	.277
TPTD	-.1140	.274
TPTND	-.1050	.290
TPTB	**-.3288**	**.038**
TPTL	-.1536	.209
TPTM	-.1552	.206
SRT	**.3800**	**.019**

Table 4.10
(cont'd)

Pearson Correlation Coefficients (R) for Neuropsychological Variables and the Mississippi Scale for Combat-Related Stress

Variable	R	p
FSIQ	-.3833	.018
VIQ	-.3988	.015
PIQ	-.2718	.073
INFO	-.2435	.097
COMP	-.4830	.003
ARIT	-.1569	.204
SIMI	-.3973	.015
DSPA	-.1254	.255
VOCA	-.4671	.005
DSYM	-.0468	.403
PCOM	-.3524	.028
BDES	-.0286	.440
PARR	-.3812	.019
OASS	.1989	.146

No pathognomonic signs were noted among veteran subject data, in terms of aphasia and sensory-perception tests (Table 4.6).

PTSD positive and PTSD negative groups did not differ significantly (Bonferri adjusted p = .002) on any of the neuropsychological or WAIS-R measures. These groups were therfore combined (Table 4.6).

With the PTSD positive and PTSD negative groups collapsed into a "combined veteran" group, some differences were noted when the new group was compared to their age-mate controls (Comparison 2, Table 4.7). A trend toward significance was noted on two measures, the verbal auditory listening test, (Speech Sounds Perception Test), as well as on dominant measures of the grip strength test, using the hand dynamometer. By chance, one would expect, using a Bonferri adjustment, that 1.3 measures would fall into the significant range. Further, p values for the two tests were not less than .002 and results were thus seen as likely due to chance. Of note were some positive WAIS-R differences, significant at p <.002 between the combined veteran samples and the WAIS-R norms, specifically verbal subtests (Information, Comprehension, Similarities and Vocabulary), with resulting higher Verbal and Full Scale I.Q. results.

4.5.1 Results of Hypotheses

At the end of chapter three, three hypotheses were presented in the null form, and are restated below:

1. **There are no differences between combat veterans with post-traumatic stress disorder and combat veterans without post-traumatic stress disorder, as determined by a battery of neuropsychological tests, as well as a standard measure of combat-related stress.**

Results of t-tests between these two group showed that no significant differences were measured (see Comparison 1, Table 4.6). Hypothesis 1 is therefore not rejected.

2. **There are no differences between combined groups of combat veterans and civilian controls**

Results of t-tests and z-tests between these two groups showed that there was a trend for a difference on the Speech Sounds Perception Test and Hand dynamometer Test, dominant hand (see Comparison 2, Table 4.7), but these were not significantly different after the significance level was adjusted by the number of tests (Bonferri adjustment = .05/25 = .002). The neuropsychological findings therefore did not exceed chance expectations. Of note, however, were some positive WAIS-R differences, significant at $p < .002$ between the combined veteran samples and the WAIS-R norms, specifically verbal subtests (Information, Comprehension, Similarities and Vocabulary), with resulting higher Verbal and Full Scale I.Q. results. Hypothesis 2 is therefore rejected with respect to WAIS-R verbal functions.

4.5.2 Results of Supplementary Hypotheses

In terms of specific HRNTB and WAIS-R test results deficit patterns were as follows:

(a) consistency with DSM-III-R symptomatology, in terms of Section D, i.e., "increased arousal" resulting in difficulty concentrating and hypervigilance, was noted as follows:

Speech Sounds Perception Test: combined veteran sample showed a trend for significant difference from controls; as well, 19 subjects out of 30 scored above the 90th percentile (63.33%), and 13 out of 30 scored above the 95th percentile (43.33%), in terms of error rate.

Trail-Making Test, Parts A and B: combined veteran sample showed no significant dysfunction, when compared to controls;

Halstead Category Test: combined veteran sample showed no significant dysfunction, when compared to controls;

Tactual Performance Test, dominant and non-dominant hands, as well as location scores: combined veteran sample showed no significant dysfunction, when compared to controls; using both hands, however, 50% of the combined veteran groups scored above the 90th percentile, while 26.6% scored above the 95th percentile; as well, 43.33% error was found among combined veteran TPT Memory scores above 95% significance.

Seashore Rhythm Test: combined veteran sample showed no significant dysfunction, when compared to controls;

WAIS-R Arithmetic, and Digit Span: combined veteran sample showed no significant dysfunction, when compared to controls; however, 43.3% tested above the 90th percentile on

Digit Symbol, in terms of errors. As noted, however, were some positive WAIS-R differences, significant at p <.002 between the combined veteran samples and the WAIS-R norms, specifically verbal subtests (Information, Comprehension, Similarities and Vocabulary), with resulting higher Verbal and Full Scale I.Q. results.

(b) in terms of consistency with the findings of Klonoff, et al. (1976), only Speech Sounds Perception Test scores appeared to be within the dysfunctional range; scores on Seashore Rhythm were unremarkable, and Halstead Category scores were better than those of civilian controls.

In sum, about 16.4% of all test variables scored above the 95th percentile (about 1.65 standard deviations above the mean), i.e., within a "clinically significant" range, in terms of impairment when compared with controls for HRNTB variables and published norms for I.Q. variables: 15.7% were among the HRNTB, and 0.7% among WAIS-R data. Further, most variables increased in significance when the cutoff was lowered to the 90th percentile, i.e., about 1.25 standard deviations above the mean: 22.14% for HRNTB, and 3.09% for WAIS-R variables, for a total of 25.23%. The common feature for TPTB, TPTM, and SSPT may be said to be a distractibility factor, one that would confound attention and concentration in problem solving, and typically seen to be a function of increased arousal. Thus, 47 of 93 scores (50.53%) among the neuropsychological variables loading on this factor appear to have been identified as clinically significant in the combined veteran sample. By chance, we would expect 21 scores (22.5%) to be significant. The inference is that distractibility emerges as a test factor of clinical significance in this sample.

Finally, Pearson Correlation Coefficients between all neuropsychological variables (including WAIS-R) and the individual veteran's score on the Mississippi Scale for Combat-Related Stress (see p. 34), regardless of the cutoff value of 107, were made for purposes of examining dysfunctional trends among score data, if any. It was found that, except for Object Assembly, all WAIS-R variables were negatively correlated with the Mississippi Scale. That is, as self-reported symptomatology for combat-related stress increased, WAIS-R performance decreased. A notable negative correlation was determined between Picture Arrangement and the Mississippi Scale. As well, interestingly, were significant negative correlations between WAIS-R verbal subtests of Comprehension, Vocabulary, Similarities, and Mississippi scores. The positive skew of verbal subtest results, when compared to their civilian controls, may be explained by the subjects' overall advanced education and careers: Most veterans had careers in the professions. Moreover, these careers were obtained since their return from Vietnam, and the veterans' better verbal performance is therefore not likely due to combat experience. The negative correlations of verbal tests with Mississippi scores, on the other hand, are more likely due to a distractibility factor arising from the veterans' combat experiences.

Among HRNTB variables, weak negative correlations were also found between FTAPD and FTAPND, TPTD, TPTND, TPTM and TPTL, and Mississippi Scale results. No significance was read into these correlations, however. Consistent with expectations was a significant positive correlation for SRT (i.e., Pearson's R = -.3800, p <.019.) Bonferri adjustments best explain the negative correlations between TPT and Mississippi Scale results. In sum no significant correlations emerged among HRNTB data and the Mississippi Scale.

4.6 Supplementary Analyses

Composite neuropsychological profiles were made of data means (given in Appendix I), expressed as a single "average" veteran profile. For combined PTSD positive and PTSD negative samples, WAIS-R data suggests that both verbal and non-verbal (i.e. "Performance" scores) are insignificant in terms of range and pattern. Measures typically held to suggest distractibility, i.e., (oral) Arithmetic and Digit Symbol (a written associative memory task) scored in the average range. Better verbal subtest scores, as noted, may be due to the majority of these veterans' careers in the professions. Non-verbal Wechsler Adult Intelligence Scale - Revised findings were similarly patterned: Perceptual awareness and reasoning ability tested as basically unimpaired.

HRNTB results were free of pathognomonic signs. A trend of significance noted for the Speech Sounds Perception Test may indicate that the test's complexity, demand of attention and concentration, as well as the ability to form a learning set would more readily tax frustration thresholds and ability to bind distractibility. A similar trend for dominant hand dynamometer results was seen to be significant only when compared with civilian controls. The Abilities Profile of Control Subjects (reported in Appendix I) however, indicates that Controls in this investigation have higher than average results in these measures, and that differences between controls and PTSD negatives will be spuriously enlarged. Moreover, the negative correlations of verbal tests with Mississippi scores are more likely due to a distractibility factor arising from the veterans' combat experiences.

4.7 Summary

The overall pattern of impairment did not clearly isolate PTSD positive subjects as being relatively more impaired than PTSD negative subjects.

In sum, about 16.4% of all test variables scored above the 95th percentile (about 1.65 standard deviations above the mean), i.e., within a "clinically significant" range, in terms of impairment when compared with controls for HRNTB variables and published norms for I.Q. variables: 15.7% were among the HRNTB, and 0.7% among WAIS-R data. Chance occurence, however, would suggest some 22.5% of scores to be among the HRNTB, and 0.7% among WAIS-R data. Chance occurence, however, would suggest some 22.5% of scores to be significant, and the overall results cannot be viewed as identifying these veterans to be impaired on the neuropsychological measures.

However, a distractibility factor emerged as significant among the test subjects. Forty-seven of 93 scores (50.53%) among the neuropsychological variables loading on this factor (TPTB, TPTM, and SSPT) were identified as clinically significant in the combined veteran sample. By chance, we would expect 21 scores (22.5%) to be significant. As well, the negative correlations of verbal tests with Mississippi scores are more likely due to a distractibility factor arising from the veterans' combat experiences. The inference is that distractibility emerges as a test factor of clinical significance in this sample.

Clinical observations made during the administration of the TPT, during which subjects were blindfolded, were that most veterans expressed reservations about the procedure, several of them initially refusing the task. These findings are consistent with relatively high distractibility seen among psychiatric patients suffering from anxiety disorders in the performance of the TPT, and these findings may indicate that frustration thresholds among these veterans, regardless of the presence of PTSD, is lower than the general population. Moreover, distractibility would seem to be restricted to "handicapped" tasks, in terms of personal control, such as lengthy and involved attention and concentration (SSPT) and loss of sight (TPT), but remaining at more manageable levels in tasks allowing for more control with familiar stimuli, such as arithmetic and digit span.

CHAPTER V

Discussion

5.1 Introduction

In this chapter, the findings of the present investigation are reviewed, and in light of their validity limitations, the findings are argued as manifestations of a theoretical framework. Lastly, a few suggestions for further research are presented.

5.2 Findings; Rationale for the Findings; and Validity Limitations of the Investigation

In this evaluation, standardized neuropsychological tests were used with two groups of Vietnam veterans: Those with post-traumatic stress disorder (N=7), and those without (N=23), as assessed by a widely used clinical instrument, the Mississippi Scale for Combat-related Stress (Keane et al., 1987). The aim was to evaluate possible neuropsychological correlates of the disorder.

It was argued that, as a sensitive measure of disordered neuropsychological functioning, the instrument of application was the Halstead-Reitan Neuropsychological Test Battery, including aphasia and sensory-perceptual tests, as well as the Wechsler Adult Intelligence Scale - Revised. Arguing from a DSM-III-R deficit perspective, in terms of heightened arousal as disruptive of cognitive efficiency, it was posited that PTSD symptomatology would disrupt HRNTB and WAIS-R testing on measures loading, in part, on a distractiblity factor: SSPT, TMTA, TMTB, HCAT, TPTD, TPTND, TPTB, TPTL, TPTM, SRT, ARIT, DSPA, and DSYM.

Non-hospitalized veterans were approached both in Edmonton, AB, and Missoula, MT, to act as volunteer subjects, and their results were compared with age-mate civilian controls (N=40). The volunteers were apprised of their test findings.

T-tests of means showed three marginally significant differences between American and Canadian subjects, but these were held to be insignificant, after a Bonferri adjustment for the number of signific; the two samples were therefore collapsed. The overall pattern of impairment did not clearly isolate PTSD positive subjects as being relatively more impaired than PTSD negative subjects. Nor were differences significant between PTSD positive and PTSD negative subjects, and these groups were collapsed further. Comparisons were finally made between one group of veterans and civilian controls. Veteran test results showed no pathognomonic signs, and overall test data were inconsistent with a diagnosis of organic brain dysfunction.

In terms of cutoff scores, 16.4% of all test variables scored above the 95th percentile, i.e., within a "clinically significant" range. Chance occurence, however, would suggest some 22.5% of scores to be significant, and the overall results were viewed as insufficient for identifying these veterans to be impaired on the neuropsychological measures. No pattern of lateralization of impairments was noted. Of note, however, were some positive WAIS-R differences, significant at p <.002 between the combined veteran samples and the WAIS-R norms, specifically verbal subtests (Information, Comprehension, Similarities and Vocabulary), with resulting higher Verbal and Full Scale I.Q. results.

Moreover, a distractibility factor emerged as significant among the test subjects. Forty-seven of 93 scores (50.53%) among the neuropsychological variables loading on this factor (TPTB, TPTM, and SSPT) were identified as clinically significant in the combined veteran sample. By chance, we would expect 21 scores (22.5%) to be significant. The inference was made that distractibility emerges as a test factor of clinical significance in this sample.

Clinical observations made during the administration of the TPT, during which subjects were blindfolded, were that most veterans expressed reservations about the procedure, several of them initially refusing the task. These findings are consistent with relatively high distractibility seen among psychiatric patients suffering from anxiety disorders in the performance of the TPT, and these findings may indicate frustration thresholds among these veterans, regardless of the presence of PTSD, to be lower than the general population.

In sum, about 16.4% of all test variables scored above the 95th percentile (about 1.65 standard deviations above the mean), i.e., within a "clinically significant" range, in terms of impairment when compared with controls for HRNTB variables and published norms for I.Q. variables: 15.7% were among the HRNTB, and 0.7% among WAIS-R data. Chance occurence, however, would suggest some 22.5% of scores to be significant, and the overall results cannot be viewed as identifying these veterans to be impaired on the neuropsychological measures.

It was found that, except for Object Assembly, all WAIS-R variables were negatively correlated with the Mississippi Scale. That is, as self-reported symptomatology for combat-related stress increased, WAIS-R performance tended to decrease. Most notable correlations were found between WAIS-R verbal subtests of Comprehension, Vocabulary, Similarities, as well as Picture Arrangement and Mississippi scores. This is not unreasonable, given the known disruption of anxiety on abstractive thought.

On the other hand, mildly better scores were noted among these same tests of verbal comprehension and expression, when compared to civilian controls. In addition, the veteran groups scored significantly better than their civilian comparison group in Halstead's Categories test, a measure of non-verbal abstract concept formation, involving a minimum of cues and requiring good problem-solving and frustration tolerance skills.

Among HRNTB variables, mild negative correlations were also found between FTAPD and FTAPND, and Mississippi Scale results, an unexpected finding, given the lack of evident correlation between the scale's five factors with these motor functions. Also consistent with expectations was a significant positive correlation for SRT and the Mississippi Scale (i.e., Pearson's R = -.3800, p <.019.)

Outliers, however, best explain the negative correlations between TPTD (with three outliers, one of which was "extreme"), TPTND (with four outliers, three of which were extreme), TPTB (with three outliers, one extreme), TPTL (one outlier) and TPTM (one outlier) and Mississippi Scale results. The small sample size with these few highly idiosyncratic responses--the subjects who were outliers on TPT did not test impaired on other measures--will have skewed results in a direction contrary to expectations.

When comparing the significantly better results of WAIS-R Verbal and HCAT to the poorer results obtained on the SSPT, TPTB, TPTM and DSYM, the supposition arose that the unique forms of attending and concentrating in these latter tasks, i.e., involving the visual deciphering of nonsense words delivered orally and working while blindfolded, in their complexity and unfamiliarity, likely increased distractible responses. Moreover, the reasonably adjusted veterans participating in this study may be able to bind distractibility in more familiar circumstances where they are permitted to function with a full range of response skills. Removal, however, of an important sense modality, like sight, with its implied diminished personal control over the immediate environment, may be sufficiently frustrating for distractibility to disrupt their cognitive efforts.

A further rationale may involve Seligman's (1967) work in learned helplessness. It will be remembered that dogs given inescapable electric shock in those experiments showed several classes of deficits 24 hours later in a shuttlebox where the simple act of crossing a barrier would terminate the shock. In contrast to dogs who had not previously experienced shock, these dogs showed: (a) motivational deficits, rarely initiating attempts to escape; (b) learning deficits, not following an occasionally successful escape response with another; and (c) emotional deficits, passively enduring the shock without overt signs of emotionality. These deficits were posited to be the consequences of learning by the dogs, i.e., that responses and outcomes (viz., shocks) were independent of each other, that nothing the animals did effected the events. Seligman posited an expectation of future uncontrollability (i.e., helplessness) to be generalized to the new situation where it produced the observed deficits. Moreover, Keane et al. (1985) showed that stimulus generalization from the battlefield may contribute to such symptoms as intrusive thoughts, vivid recollections and terrifying nightmares. It was reported by Gill (1989) that such psychotic symptoms may have neuropsychological sequelae.

Finally, it was noted that a loss of task orientation might be consistent with the disruptive effects of anxiety, as is seen among distressed psychiatric patients, who frequently abandon this test, despite their best efforts. It is submitted that the veteran's struggle with the unfamiliar, sightless task of the TPT may invoke some or all of these factors to interfere with cognitive functioning.

A working hypothesis--that PTSD may be manifest, consistent with affective disorder, in right hemisphere performance decrements, as suggested by some of the reported literature (e.g., Burges Watson, Hoffman, & Wilson, 1988; Flor-Henry et al., 1979, 1982)--could not be moved forward for assessment after the groups were statistically collapsed. Clearly, the present findings do not contraindicate the possible presence of affective disorder, but, in a non-hospitalized sample of veterans, neuropsychological tests would appear to lack diagnostic specificity.

Some final limitations of this investigation need to be identified. The first is that of sample size. Recruitment of this population, it was noted in Chapter 3, is confounded by the relative competency these veterans display, when compared to their hospitalized cohorts. Grady et al. (1989) and Stretch (1988) have observed the need further to examine this population. As a consequence, this study's small sample size precludes valid generalizations from the present data to be made about post-traumatic stress disorder. Moreover, examiner bias must be guarded against in an evaluation of the consquences of extreme stress, such as war, and particularly this war, so frequently unresolved among its survivors. Indeed, it emerged among the Edmonton group of subjects, that a series of therapeutic encounters would be clinically desirable as consequence for having participated in the study.

5.3 Implications of the Findings

Notwithstanding the limitations of the present study, the opportunity for gathering valid data during sometimes intense testing encounters may be an optimal procedure with members of this frequently reclusive population. The wide neuropsychological net of this form of assessment permits the clinician perhaps a more discrete insight into the client's symptoms as they emerge. While the evidence would seem to indicate that the aphasic and sensory-perceptual components of the HRNTB may be irrelevant for cerebrally intact individuals, the more complex components, that load on frustration-tolerance factors, may help in delineating the client's therapeutic concerns. Be that as it may, the symptom-specific picture that emerges with a neuropsychological assessment battery may be more helpful in charting a therapeutic course for the veteran, with or without PTSD, for whom frustration tolerance has become an issue.

Given the finding of about 16% of test results scoring above a clinically significant cutoff of 95%; the emergence of a distractibility factor among the test scores; and the negative correlation between WAIS-R Verbal results and the

Mississippi scale--while controlling for the very small N--an inference of the overall findings might be that this group of veterans underreported their symptoms on the Mississippi scale. (Others may have overreported, particularly those in a position of applying for benefits under the VA). Notwithstanding, the suggestion that symptom denial, or perhaps avoidance of effectively engaging the symptom and its personal and interpersonal complications, may be corroborated by these findings. Moreover, it may be that the underreporting veteran is attempting to maintain a facade of competence at some considerable psychic costs, for fear of giving in to accusations (by self or others) of having failed to survive effectively. By the same token, the veteran admitting to struggling with PTSD, having no points to make in this argument, may indeed fare better under stressful circumstances, and have better test results. This interpretation would be consistent with anecdotal clinical observations of therapists specializing in treating veterans.

5.4 Indications for Further Research

The literature makes a case for a multiaxial diagnostic approach to combat-related post-traumatic stress disorder (Keane et al., 1987). Moreover, the case for establishing local norms has been made in the use of combat-stress measuring instruments (Watson, Kucala, & Manifold, 1986). It is axiomatic that greater diagnostic validity is obtained in this way. To that end, further neuropsychological correlational measures could be taken among the veteran population for the broadening data base of symptoms of this group.

A frequently neglected segment of the veteran population is the group of women who served in Vietnam. Mostly nursing staff, these women were exposed to extraordinary stresses in the form of constant pressure of attending battle trauma, providing emotional support to recovery patients as well as physician and other officer colleagues, and having few recreational outlets. They share with their male patients the stress of enduring a largely indifferent public, both on their return and now. This population is very under-represented in the literature.

The Canadian contribution to the Allied war effort in Vietnam is similarly neglected by researchers. As stated, there are an estimated 40,000 former U.S. servicemen from the Vietnam war now living in Canada, most of whom were Canadian citizens at the time of their service. Like the "Mack-Papps" before them, who fought for the Republicans in Spain during that country's civil war, the Canadian government has seen fit to ignore their plight, even unofficially. A comparison between these two politically alienated groups of warriors may give further information about the effects of such alienation. Post-traumatic stress disorder symptoms, as we have seen, appear to be exacerbated by this phenomenon.

Neuropsychological measures appear to hold promise in determining sensitive disruptions to cognitive efficiency, even in the absence of "brain damage." Research with these instruments on victims of Agent Orange is recommended. Given its even greater clinical controversy than that of PTSD, the neuropsychological consequence of this widely used defoliant during the Vietnam war awaits better clinical understanding.

Flashbacks have emerged as one of the most troubling and tenacious symptoms of combat-related post-traumatic stress disorder. The full-stop nature of these experiences would indicate brain involvement, viz., impairment. Further research, using neuropsychological measures, might help delineate functional competency of veterans with these symptoms. As noted by several researchers (eg., Breslau et al., 1987; Green et al., 1989) reliable diagnosis of this multifacted disorder is confounded by unresolved etiological issues. A research focus is proposed that would correlate neuropsychological measures, among those veterans selected as suffering from PTSD, with autonomic response factors on different questionnaire instruments in current use.

A therapeutic research suggestion has devolved from the group of veteran participants in the present investigation. The literature indicates several avenues of treatment intervention with PTSD veterans, such as reliving the traumatic event, learning to "permit" oneself to have survived, peer therapy, as well as addressing the anxillary problems of substance abuse, family issues, lack of vocational directions, etc. A focus of research might be to address the personal loss each veteran has experienced as a function of having participated in the Vietnam war generally, and as having been wounded, specifically. Pitman, Altman, and Macklin (1989) indicate a significantly higher proportion of wounded veterans among those with PTSD. A phenomenological study describing the shared experience, including dream content, of such encounters would be pioneering.

Finally, unlike previous wars, the unique circumstances surrounding the Vietnam conflict have, in part, contributed to the veterans' withdrawal from "mainstream" society. A very significant minority have settled in the mountain states and some in Canada, eschewing the advantages of opportunity in the bigger centers. Longitudinal studies tracing these individuals through mid-life might give greater understanding to their developing sense of meaning surrounding the war involvement. Some Missoula veterans, for instance, have unilaterally contacted Soviet Afghan war veterans. (They report, incidentally, a similar pariah status of the Soviet Afghansti, as they are known, in their own society.) As of this writing, there have been several visits to each others' countries by the former combatants. The veteran participants of the present study who are involved in this exchange express a keen purpose for maintaining such contacts, if only to help in validating their own experiences, and thus create meaning for them.

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APPENDIX I

COMPOSITE NEUROPSYCHOLOGICAL PROFILES

This appendix contains composite profiles for the combined veteran groups. Profiles are based on mean scores, with neuropsychological norms from the control group (Yeudall et al., 1987) and I.Q. norms from published tables (Wechsler, 1981). They are to provide a visual display of what an average member of this group resembles in terms of neuropsychological variables. For a clinical "interpretation" of the composite profiles, please refer to Section 4.5, p. 136.

NEUROPSYCHOLOGICAL TEST RESULTS

ABILITIES PROFILE

Combined Veterans

STANDARD DEVIATIONS*

			Impaired			Normal			Above N	
	$\bar{X}$	-2		-1		0		1		2
Verbal Abilities:										
SSPT	6.8		x							
WAIS-R VIQ	112.1						x			
Non-verbal Abilities:										
SRT	3.2					x				
WAIS-R PIQ	106.1						x			
Perceptual-motor Abilities:										
TMTA	29.5				x					
TMTB	70.6				x					
Abstractive Abilities:										
HCAT	28.5						x			
Learning/Memory:										
TPTL	4.3				x					
TPTM	6.8		x							
Attention/Concentration:										
SRT	3.2					x				
SSPT	6.8		x							
Motor Functions:										
DYND	48.5				x					
FTAPD	52.6				x					
DYNND	45.6				x					
FTAPND	46.5				x					
Sensory-Perceptual Tests:										
TPTD	5.1				x					
TPTND	4.3				x					
TPTB	3.4			x						

*Approximately 2% of the population falls below -2 SD and exceeds +2 SD.

Norm referenced from the control group (Yeudall et al., 1987).

NEUROPSYCHOLOGICAL TEST RESULTS

ABILITIES PROFILE

Combined Subjects
(cont'd)

STANDARD DEVIATIONS*

		Impaired				Normal		Above N		
	$\overline{X}$	-2		-1		0		1		2
WAIS-R										
FSIQ	110.0						x			
VIQ	112.1						x			
PIQ	106.0						x			
INFO	11.9						x			
COMP	13.5							x		
ARIT	10.7						x			
SIMI	12.1						x			
DSPA	9.0				x					
VOCA	12.5						x			
DSYM	8.6				x					
PCOM	11.3						x			
BDES	9.8					x				
PARR	10.4					x				
OASS	9.9					x				

*Approximately 2% of the population falls below -2 SD and exceeds +2 SD.

Norm referenced from published tables (Wechsler, 1981).

APPENDIX II

(PTSD-RS)

The Mississippi Scale For Combat-Related PTSD

V.A. Medical Center
Jackson, Mississippi

(Reprinted by permission)

(All answers range from zero to five on an ascending scale).

1. Although I do not have many close personal friends now, before I entered the military I had many friends.
2. I feel no guilt over things that I did in the military.
3. If someone pushes me too far, I am likely to become violent.
4. If something happens that reminds me of the military, I become very distressed and upset.
5. The people who know me best are afraid of me.
6. I am able to get emotionally close to others.
7. I have nightmares of experiences in the military that really happened.
8. When I think of some of the things I did in the military, I wish I were dead.
9. It seems as if I have no feelings.
10. Lately, I have felt like killing myself.
11. I fall asleep, stay asleep and awaken only when the alarm goes off.
12. I wonder why I am still alive when others died in the military.
13. Being in certain situations makes me feel as though I am back in the military.
14. My dreams at night are so real that I waken in a cold sweat and force myself to stay awake.
15. I feel like I cannot go on.

16. I do not laugh or cry at the same things other people do.

17. I still enjoy doing many things that I used to enjoy.

18. Daydreams are very real and frightening.

19. I have found it easy to keep a job since my separation from the military.

20. I have trouble concentrating on tasks.

21. I have cried for no good reason.

22. I enjoy the company of others.

23. I am frightened by my urges.

24. I fall asleep easily at night.

25. Unexpected noises make me jump.

26. No one, not even my family, understands how I feel.

27. I am an easy-going, even-tempered person.

28. I feel there are certain things that I did in the military that I can never tell anyone about because no one would ever understand.

29. There have been times when I used alcohol (or other drugs) to help me sleep or to make me forget about things that happened while I was in the service.

30. I feel comfortable when I am in a crowd.

31. I lose my cool and explode over minor everyday things.

32. I am afraid to go to sleep at night.

33. I try to stay away from anything that will remind me of things which happened while I was in the military.

34. My memory is as good as it ever was.

35. I have a hard time expressing my feelings even to the people I care about.